

**LOWER OVERBURDEN AQUIFER
INJECTION WELL
FEASIBILITY REPORT
FOR
FORMER HEXCEL INDUSTRIAL
CHEMICALS FACILITY**

**Lodi Borough, Bergen County
Lodi, New Jersey**

ECRA Case #86009

Submitted to:

**HEXCEL Company
11555 Dublin Boulevard
Dublin, California 94568**

Prepared by:

**Heritage Remediation/Engineering, Inc.
5656 Opportunity Drive
Toledo, Ohio 43612**

April 8, 1992



HERITAGE REMEDIATION/ENGINEERING, INC.



5656 Opportunity Drive
Toledo, OH 43612
Phone: 419/478-4396
FAX: 419/478-4560

April 8, 1992

Mr. A. William Nosil
Engineering Manager
HEXCEL Company
11555 Dublin Blvd.
Dublin, CA 94568

Re: Lower Overburden Aquifer
Injection Well Feasibility Report
Fine Organics Project
Lodi, New Jersey
HR/E Project No. 61026

Dear Mr. Nosil:

Attached is the above referenced Lower Overburden Aquifer Injection Well Feasibility Report. This report details information derived from the aquifer pumping tests and slug tests of the lower overburden aquifer. Our findings indicate the eight-inch diameter pilot well will not accept more than four gallons per minute of water due to aquifer characteristics.

Should you have any questions or concerns, please do not hesitate to call.

Respectfully,
Heritage Remediation/Engineering, Inc.

A handwritten signature in black ink, appearing to read "Robert R. Beckwith".

Robert R. Beckwith, CPG
Senior Hydrogeologist

Attachment

cc: Gary Sanderson (3 copies)

92RB2025.T1

1.0 INTRODUCTION

Pilot Injection well (PI-1) was installed in the vicinity of CW-17 and RW7-6. PI-1 is 32 feet in depth with an outer casing 18 feet in depth (approximately eight feet into the silty clay unit). The outer well casing is 12 inches in diameter; the inner well is 8 inches in diameter. The well screen is 10 feet in length and constructed of 0.010-inch wrapped stainless steel, and the riser is constructed of galvanized steel. PI-1 was developed using pumping methods, and the development water was placed in drums and transferred to the treatment system. Appendix A, Attachment 1 includes the well completion diagram and boring log for PI-1.

Following installation of PI-1 an aquifer pumping test was conducted using nearby lower overburden aquifer monitoring wells for distance-drawdown measurements. The 24-hour aquifer pumping test was initiated on October 18, 1991. The average pumping rate during the test was 4 gallons per minute. An In-Situ HERMIT 1000B data logger and two 10 psig pressure transducers were utilized to collect data from PI-1 and MW-9 (nearest lower overburden aquifer monitoring well).

To further characterize the lower overburden aquifer, slug tests were conducted on a number of the monitoring wells on October 15, 1991 to estimate the hydraulic conductivity, transmissivity and storativity.

2.0 GROUND-WATER HYDRAULICS OF THE LOWER OVERBURDEN AQUIFER

The importance of a water bearing formation can be measured by its ability to transmit and to store water. These two hydraulic characteristics can be measured with the coefficients of transmissivity (T) and storativity (S).

2.1 Trend Measurements in the Lower Overburden Aquifer

Prior to initiation of the aquifer pumping test of PI-1, water level trends were monitored in PI-1 and MW-9. During the collection of this data, water level fluctuations were observed in these two wells during the initial stages of measurements. Once the pump in Fine Organic's Production Well (PW) was turned off after 24 minutes of trend data

collection, a noticeable increase in the water levels were recorded. Appendix A, Attachment 2 contains the data from PI-1 and MW-9 trends. An increase of approximately 0.30 feet in water levels were recorded in both wells 55 minutes after the PW pump was turned off.

2.2 Lower Overburden Aquifer Pumping Test

A 24-hour pumping test was performed on PI-1 using lower overburden monitoring wells for distance-drawdown measurements. Maximum distance/drawdown data are presented in Table 1. Pilot well PI-1 would produce an average of only 4 gallons per minute.

TABLE 1
DISTANCE-DRAWDOWN DATA
(after 900 minutes)

Well No.	Distance (ft)	Drawdown (ft)
PI-1	0.33	12.14
MW-3	203	0.13
MW-5	197	0.03
MW-9	33	0.25
MW-11	186	0.18
MW-13	100	0.13
MW-15	220	0.09
MW-19	375	0.05

The Jacob straight line method (Cooper and Jacob 1946) was used to evaluate hydraulic parameters as summarized in Table 2. A computer program, "Easy Jacob", July 1991 by Endless Mountain Groundwater, Etters, Pennsylvania, was utilized to generate the straight line graphs. Pump test data and results are presented as Figures B-1 through B-8 in Appendix B. Each monitoring well in Table 2 was paired with PI-1 to create a straight line for estimating the transmissivity and storativity between each well pair.

Also, all the monitoring wells (excluding PI-1) were grouped for a straight line graph (see Figure B-8).

The latter straight line indicates an inefficient well, as the straight line did not include the drawdown in PI-1 for a theoretical 100% efficient pumping well. Based upon theoretical drawdown and actual drawdown, PI-1 is 12% efficient. This can be attributed to the well screen slot size needed to filter the fine-grained formation and to possible inadequate well development which may result in partial screen blockage by finer-grained sediments.

After approximately 30 minutes, the cone of depression at PI-1 indicates a less permeable boundary as indicated by the steeper drawdown slope. After approximately 90 minutes, the cone intersects a recharge area, possibly from the Saddle River. Observation well MW-9 indicated a more permeable boundary, or recharge from the river, after 100 minutes of pumping.

Under ideal hydrogeological conditions, the maximum transmitting capacity of a 0.010-inch well screen with an entrance velocity of 0.1 ft/sec is 8.68 gpm/ft. Due to the moderate permeability of the formation, the average entrance velocity was only 0.05 ft/sec. This caused excessive drawdown in the pumping well.

TABLE 2
DISTANCE-DRAWDOWN
PUMPING TEST RESULTS

Well No.	Transmissivity (gal/day/ft)	Storativity
MW-3	4.80×10^2	1.7×10^{-3}
MW-5	4.80×10^2	1.7×10^{-3}
MW-9	3.60×10^2	4.4×10^{-2}
MW-11	4.80×10^2	1.7×10^{-3}
MW-13	4.40×10^2	5.6×10^{-3}
MW-15	5.03×10^2	1.3×10^{-3}
MW-19	5.28×10^2	6.3×10^{-4}
AVG.	4.67×10^2	8.1×10^{-3}

Differences in the transmissivities and storage coefficients were calculated from each of the distance-drawdown plots. These differences are due to the highly variable geology in the vicinity of the pilot well and the effects of this geology on the ground-water flow towards the wells. Storativity results indicate a leaky confined aquifer. Time-drawdown graphs are presented in Appendix C. Figures C-1 and C-2 illustrates the time-drawdown plot for PI-1. Figure C-1 indicates a slope (slope #1) consistent with normal drawdown of a pumping well. After approximately 30 minutes, the cone of depression at PI-1 exhibits a less permeable boundary as indicated by the steeper drawdown slope (see Figure C-2, slope #2). After approximately 90 minutes, the cone intersects a recharge area, possibly influenced by the Saddle River.

2.3 Ground-Water Contours of the Lower Overburden Aquifer

Ground-water contour maps were generated from data collected at the start of the pumping test, and at 900 minutes (optimum drawdown). Figure 1 represents ground-water contours prior to the start of the pumping test. This figure indicates regional ground-water flow direction towards the south, nearly perpendicular with the

Saddle River. Figure 2 represents a contour map from data collected at 900 minutes into the test. Changes in water levels were used to construct this map. This figure reveals pumping effects extending as far as MW-19.

2.4 In Situ Hydraulic Conductivity Tests

Slug tests were performed on lower overburden aquifer monitoring wells to estimate the transmissivity and storativity of the lower overburden aquifer. An In-Situ HERMIT data logger and pressure transducers were utilized to monitor and store data. The SLUGIX program (Cooper et al.) was used for calculating the parameters. Appendix D contains the plots of each well. A volume water was removed from each well by utilizing a PVC bailer with a capacity of approximately 2 gallons. Table 3 summarizes the results of the slug tests. Slug test values indicate relatively moderate to high hydraulic conductivity consistent with fine-grained to coarse-grained sands comprising the aquifer. Differences in transmissivity values are due to possible layered heterogeneity of the lower overburden aquifer.

**TABLE 3
SLUG TEST RESULTS**

Well No.	Aquifer Thickness (ft)	Transmissivity (ft^2/min)	Transmissivity ($\text{gal/day}/\text{ft}$)	Hydraulic Conductivity (ft/min)	Storativity
MW-3	7.0	2.06×10^1	2.21×10^3	2.94×10^2	1.0×10^{-5}
MW-5	6.0	2.31×10^2	2.49×10^2	3.85×10^3	1.0×10^{-5}
MW-9	4.5	4.87×10^2	5.25×10^2	1.08×10^2	1.0×10^{-4}
MW-11	11.0	2.17×10^2	2.34×10^2	1.97×10^3	1.2×10^{-4}
MW-13	6.5	6.31×10^2	6.80×10^2	9.71×10^3	1.0×10^{-5}
MW-15	5.5	2.08×10^2	2.24×10^2	3.78×10^3	1.0×10^{-4}
MW-19	6.5	4.76×10^1	5.13×10^3	7.32×10^2	1.2×10^{-5}
AVG.	6.7	1.23×10^1	1.32×10^3	1.90×10^2	1.0×10^{-5}

2.5 Laboratory Analysis of the Production Well and PI-1

A water sample of Fine Organic's Production Well was obtained from a spigot in Building 3 on October 21, 1991. Approximately $45.6 \mu\text{g/l}$ (ppb) of VOCs were found in the water. The predominant constituent was methylene chloride. Analytical results are presented in Appendix E. This water sample may have been contaminated at the spigot or through an attached hose at the spigot.

A water sample was collected from the Pilot Injection well pump discharge on October 21, 1991 for VOC analysis after the 24-hour aquifer pumping test of the well. Approximately $80 \mu\text{g/l}$ (ppb) of VOCs were found in the water sample. The predominant constituent was chlorobenzene. Analytical results are also presented in Appendix E.

A pH of 2.1 was reported in the results for the Production Well and a Ph of 2.9 was reported in the results for the Pilot Injection Well. Conversations with All-Test Laboratory indicate that a mixup occurred where a water sample was taken from the container preserved with nitric acid.

3.0 GROUND-WATER HYDRAULICS OF THE UPPER OVERBURDEN AQUIFER

Aquifer characterization tests were performed on the upper overburden aquifer in October, 1990. The results of these tests were presented in the October, 1990 Update Report. The results table from that report (Table 1) is included here as Appendix F. In-situ hydraulic conductivity test were conducted on 22 ground-water control wells and short duration pumping tests were performed on selected control wells. The purpose of this characterization was to provide a plan for a ground-water control system that would include pumping the most prolific wells utilizing the most efficient well spacing.

The hydraulic characterization of the upper overburden aquifer, showed that the average hydraulic conductivity is $3.30 \times 10^{-3} \text{ ft/min}$, with a transmissivity of $3.58 \times 10^2 \text{ gpd/ft}$. Slug test values indicate relatively moderate hydraulic conductivity consistent with fine-grained sands

comprising the aquifer. Results of the pumping tests indicated the most prolific wells would produce between 0.75 and 2 gallons per minute.

4.0 CONCLUSIONS/RECOMMENDATIONS

Our preliminary conclusions are that at least the upper portion of the bedrock aquifer is hydraulically connected to the lower overburden aquifer. During trend analysis of PI-1 and MW-9 prior to initiation of the pumping test an increase of approximately 0.30 feet in water levels were recorded in both wells 55 minutes after the PW pump was turned off.

Pilot well PI-1 would produce an average of only 4 gallons per minute. Due to the moderate permeability of the formation, the average entrance velocity through the well screen was only 0.05 ft/sec. This caused excessive drawdown in the pumping well.

Generally, the amount of water a well produces is much greater than the amount of water a well can accept. This means that a rate of injection should not exceed two gallons per minute into wells set in the lower overburden aquifer, and substantially less than one gallon per minute into wells set in the upper overburden aquifer. Therefore, to inject four gallons per minute on a long term basis, two or three wells of similar construction would be required to inject into the lower overburden aquifer. Injection of water into the upper overburden aquifer would require many wells or a significant drain field.

A 24-hour aquifer pumping test of the Fine Organic's production well would be necessary to assess the hydraulic connection between the bedrock aquifer and the lower overburden aquifer. Packer tests of the potentially productive zones identified in geophysical logging would also provide useful information. Changes in water levels should be measured in the on-site lower overburden aquifer wells.

REFERENCES

Cooper, H.H., Bredehoeft, J.D., and Papadopoulos, I.S., 1967, "Response of a finite-diameter well to an instantaneous charge of water", Water Resources Research, v.3, no.1, p. 263-269.

Cooper, H.H. and C.E. Jacob, 1946. "A generalized graphical method for evaluating formation constants and summarizing well field history." Am. Geophys. Union Trans. Vol.27, pp.526-534.

APPENDIX A

ATTACHMENT 1 - PI-1 WELL COMPLETION DIAGRAM & BORING LOG

ATTACHMENT 2 - DATA OF TRENDS FOR PI-1 AND MW-9

92RB2025.T1

884160011

HERITAGE REMEDIATION/ENGINEERING, INC

5656 OPPORTUNITY DRIVE

TOLEDO, OHIO 43612

HYDROGEOLOGIST R BECKWITH
 DRILLING COMPANY TES
 DATE OF COMPLETION 10-16-91

CLIENT HEXCEL
 JOB NUMBER 61026
 LOCATION LODI, NEW JERSEY

BORE LOG - PI-1

BLOW COUNTS	% RECOVERY SAMPLED INTERVAL	> U J W	I F E O	O Z H O OK HU EE	LITHOLOGY	LITHOLOGIC DESCRIPTION
0	0					
1	1					0 0 to -8 0 SILTY SAND Dark Brown
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					-8 0 to -11 0 COBBLE/GRAVEL Layer
9	9					
10	10					
11	11					-11 0 to -24 0 SILTY CLAY Dark Brown
12	12					
13	13					
14	14					
15	15					
16	16					
17	17					
18	18					
19	19					
20	20					
21	21					
22	22					
23	23					
24	24					-24 0 to -28 0 SILTY SAND and Gravel
25	25					
26	26					
27	27					
28	28					-28 0 to -28 50 Reddish Silty fine SANDSTONE weathered
29	29					
30	30					-28 50 to -32 0 Reddish Silty fine SANDSTONE competent
31	31					
32						

884160012

HERITAGE REMEDIATION/ENGINEERING, INC.

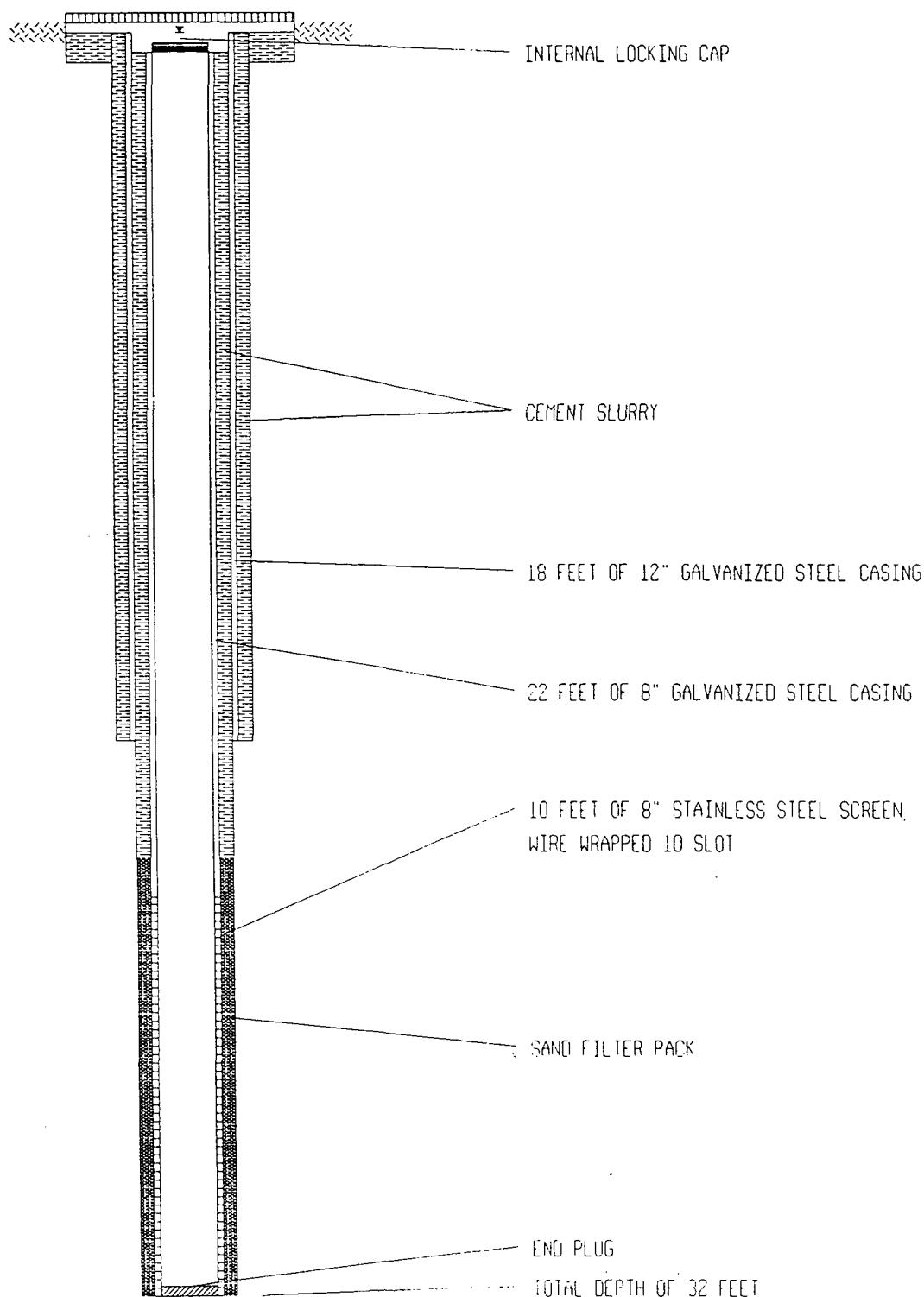
5656 OPPORTUNITY DRIVE

TOLEDO, OHIO 43612

HYDROGEOLOGIST R. BECKWITH	CLIENT HEXCEL	WELL • PI-1
DRILLING TES	JOB NUMBER 61026	BORING • PI-1
DATE-OF-COMPLETION 10-16-91	LOCATION LODI, NEW JERSEY	WATER LEVEL

TOP OF CASING ELEVATION:

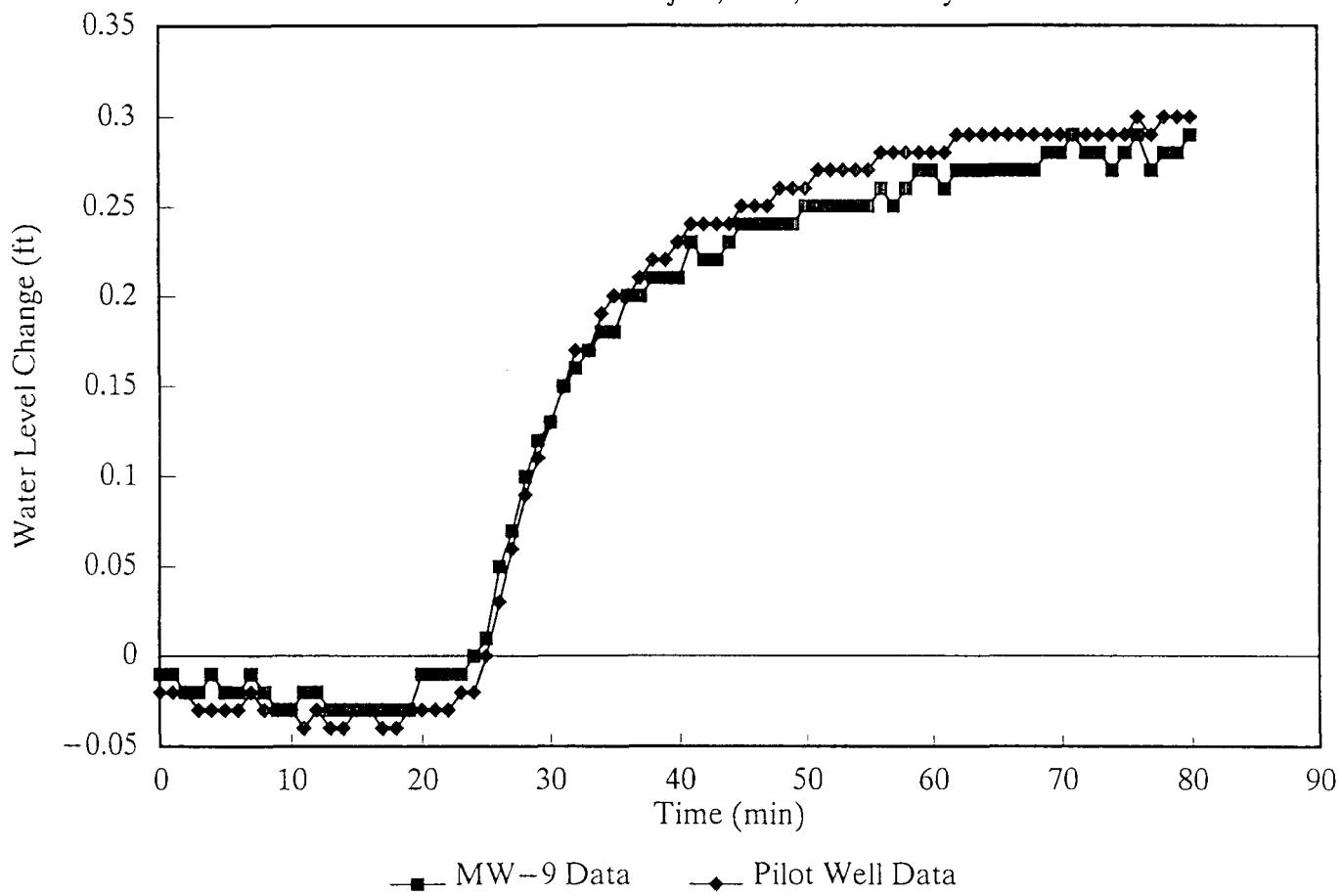
PI-1 WELL COMPLETION DIAGRAM



884160013

Trend Analysis (MW-9 and Pilot Well)

Hexcel Project, Lodi, New Jersey



884160014

PILOT WELL TREND		29.0000	-0.11	75.0000	-0.29
SE1000B		30.0000	-0.13	76.0000	-0.30
Environmental Logger		31.0000	-0.15	77.0000	-0.29
10/20 12:01		32.0000	-0.17	78.0000	-0.30
		33.0000	-0.17	79.0000	-0.30
Unit# 00797 Test# 1		34.0000	-0.19	80.0000	-0.30
		35.0000	-0.20		
INPUT 1: Level (F) TOC		36.0000	-0.20		
		37.0000	-0.21		
Reference	0.00	38.0000	-0.22		
Scale factor	15.02	39.0000	-0.22		
Offset	0.00	40.0000	-0.23		
		41.0000	-0.24		
Step# 0 10/18 14:01		42.0000	-0.24		
		43.0000	-0.24		
Elapsed Time	Value	44.0000	-0.24		
-----	-----	45.0000	-0.25		
0.0000	0.02	46.0000	-0.25		
1.0000	0.02	47.0000	-0.25		
2.0000	0.02	48.0000	-0.26		
3.0000	0.03	49.0000	-0.26		
4.0000	0.03	50.0000	-0.26		
5.0000	0.03	51.0000	-0.27		
6.0000	0.03	52.0000	-0.27		
7.0000	0.02	53.0000	-0.27		
8.0000	0.03	54.0000	-0.27		
9.0000	0.03	55.0000	-0.27		
10.0000	0.03	56.0000	-0.28		
11.0000	0.04	57.0000	-0.28		
12.0000	0.03	58.0000	-0.28		
13.0000	0.04	59.0000	-0.28		
14.0000	0.04	60.0000	-0.28		
15.0000	0.03	61.0000	-0.28		
16.0000	0.03	62.0000	-0.29		
17.0000	0.04	63.0000	-0.29		
18.0000	0.04	64.0000	-0.29		
19.0000	0.03	65.0000	-0.29		
20.0000	0.03	66.0000	-0.29		
21.0000	0.03	67.0000	-0.29		
22.0000	0.03	68.0000	-0.29		
23.0000	0.02	69.0000	-0.29		
24.0000	0.02 - PW pump	70.0000	-0.29		
25.0000	-0.00 turned off	71.0000	-0.29		
26.0000	-0.03	72.0000	-0.29		
27.0000	-0.06	73.0000	-0.29		
28.0000	-0.09	74.0000	-0.29		

MW-9 TREND		29.0000	-0.12	75.0000	-0.28
SE1000B		30.0000	-0.13	76.0000	-0.29
Environmental Logger		31.0000	-0.15	77.0000	-0.27
10/20 12:04		32.0000	-0.16	78.0000	-0.28
		33.0000	-0.17	79.0000	-0.28
Unit# 00797 Test# 1		34.0000	-0.18	80.0000	-0.29
		35.0000	-0.18		
INPUT 2: Level (F) TOC		36.0000	-0.20		
		37.0000	-0.20		
Reference	0.00	38.0000	-0.21		
Scale factor	19.96	39.0000	-0.21		
Offset	0.00	40.0000	-0.21		
		41.0000	-0.23		
Step# 0 10/18 14:01		42.0000	-0.22		
		43.0000	-0.22		
Elapsed Time	Value	44.0000	-0.23		
-----	-----	45.0000	-0.24		
0.0000	0.01	46.0000	-0.24		
1.0000	0.01	47.0000	-0.24		
2.0000	0.02	48.0000	-0.24		
3.0000	0.02	49.0000	-0.24		
4.0000	0.01	50.0000	-0.25		
5.0000	0.02	51.0000	-0.25		
6.0000	0.02	52.0000	-0.25		
7.0000	0.01	53.0000	-0.25		
8.0000	0.02	54.0000	-0.25		
9.0000	0.03	55.0000	-0.25		
10.0000	0.03	56.0000	-0.26		
11.0000	0.02	57.0000	-0.25		
12.0000	0.02	58.0000	-0.26		
13.0000	0.03	59.0000	-0.27		
14.0000	0.03	60.0000	-0.27		
15.0000	0.03	61.0000	-0.26		
16.0000	0.03	62.0000	-0.27		
17.0000	0.03	63.0000	-0.27		
18.0000	0.03	64.0000	-0.27		
19.0000	0.03	65.0000	-0.27		
20.0000	0.01	66.0000	-0.27		
21.0000	0.01	67.0000	-0.27		
22.0000	0.01	68.0000	-0.27		
23.0000	0.01	69.0000	-0.28		
24.0000	0.00 - PW ^{on} _{turned off}	70.0000	-0.28		
25.0000	-0.01	71.0000	-0.29		
26.0000	-0.05	72.0000	-0.28		
27.0000	-0.07	73.0000	-0.28		
28.0000	-0.10	74.0000	-0.27		

APPENDIX B
PUMP TEST DATA
FIGURES B-1 THROUGH B-8
DISTANCE-DRAWDOWN GRAPHS

92RB2025.T1

884160017

HERITAGE REMEDIATION/ENGINEERING, INC.
TOLEDO DIVISION



AQUIFER PUMPING TEST

LOCATION: Lodi, NJ

TEST TYPE: Constant Rate

PUMPING WELL: PI-1

FLOW MEASUREMENT: Bucket / stopwatch

DISTANCE FROM PUMPING WELL: 203' 197' 33'

CLIENT:

Hexcel 61026

DATE:

10-18-91 TO: 10-19-91

PUMP:

Teel 4" Submersible

PAGE

1 OF 2

186' 100' 220' 375' 120'

Time	Q (gpm)	PI-1 DTW (ft)	MW-3 DTW (ft)	MW-5 DTW (ft)	MW-9 DTW (ft)	MW-11 DTW (ft)	MW-13 DTW (ft)	MW-15 DTW (ft)	MW-19 DTW (ft)	MW-26 DTW (ft)
1530		5.78	10.30	11.26	8.75	10.03	9.65	8.84	7.10	7.42
1545	4	5.78								
1600		10.88								
1610	4.5	13.33								
1615		14.55								
1620		15.15								
1625		15.55								
1630	5	15.61								
1635		21.65								
1640		25.20								
1645		23.90	10.32	11.23	8.91	10.11	9.71	8.84	7.10	7.45
1655		24.80								
1705		24.75								
1710		24.24								
1715	4	23.45								
1720		23.34								
1725		22.90								
1730		22.01								
1735		21.34								
1740		21.91	10.36	11.24	8.92	10.11	9.72	8.86	7.11	7.46
1750		22.00								
1800		23.08								
1805		22.55								
1815		21.74								
1845		21.60	10.36	11.25	8.91	10.12	9.72	8.86	7.11	7.46
1855		21.40								
1925		20.86	10.34	11.24	8.90	10.12	9.72	8.86	7.11	7.48

884160018

HERITAGE REMEDIATION/ENGINEERING, INC.
TOLEDO DIVISION



AQUIFER PUMPING TEST

LOCATION: Lodi NJ

TEST TYPE: Constant rate

PUMPING WELL: PF-1

FLOW MEASUREMENT:

DISTANCE FROM PUMPING WELL:

CLIENT:

DATE:

PUMP:

PAGE

Hexcel 61026

10-18-91 TO: 10-19-91

2 OF 2

Time	Q (gpm)	PI-1 DTW (ft)	MW-3 DTW (ft)	MW-5 DTW (ft)	MW-9 DTW (ft)	MW-11 DTW (ft)	MW-13 DTW (ft)	MW-15 DTW (ft)	MW-19 DTW (ft)	MW-26 DTW (ft)
0745	4	19.15	10.43	11.29	8.96	10.21	9.78	8.93	7.15	7.48
0800	4.1	20.18								
0845		20.18	10.45	11.31	9.01	10.23	9.80	8.94	7.15	7.48
0945		20.20	10.45	11.31	9.01	10.23	9.81	8.94	7.15	7.48
1045		19.20	10.45	11.31	9.02	10.22	9.80	8.94	7.15	7.48
1145	4.2	24.10	10.47	11.31	9.03	10.24	9.82	8.94	7.15	7.48
1245	4	21.70	10.46	11.30	9.03	10.24	9.82	8.94	7.15	7.48
1345		27.00	10.47	11.32	9.05	10.26	9.83	8.95	7.17	7.48
1445		19.95	10.48	11.32	9.04	10.25	9.82	8.96	7.17	7.46
1545		20.65	10.48	11.32	9.04	10.25	9.83	8.96	7.18	7.45
1555	pump turned off									
1645		5.94	10.44	11.31	8.89	10.21	9.75	8.94	7.18	7.45
1730		5.92	10.43	11.29	8.89	10.20	9.76	8.94	7.18	7.45

PI-1 DRAWDOWN		0.3333	0.05	30.0000	8.19
SE1000B		0.4167	0.09	32.0000	8.44
Environmental Logger		0.5000	0.13	34.0000	8.63
10/20 12:10		0.5833	0.18	36.0000	8.70
		0.6667	0.25	38.0000	8.84
		0.7500	0.34	40.0000	8.98
Unit# 00797	Test# 2	0.8333	0.46	42.0000	9.08
		0.9167	0.59	44.0000	9.15
INPUT 1: Level (F) TOC		1.0000	0.67	46.0000	10.15
		1.0833	0.77	48.0000	12.33
Reference	0.00	1.1667	0.88	50.0000	14.82
Scale factor	15.02	1.2500	0.97	52.0000	17.40
Offset	0.00	1.3333	1.07	54.0000	19.97
		1.4166	1.15	56.0000	18.22
Step# 0	10/18 15:23	1.5000	1.22	58.0000	17.73
		1.5833	1.29	60.0000	17.52
Elapsed Time	Value	1.6667	1.36	62.0000	17.30
		1.7500	1.43	64.0000	17.41
0.0000	0.00	1.8333	1.49	66.0000	17.63
0.0033	0.00	1.9167	1.55	68.0000	17.75
0.0066	0.00	2.0000	1.61	70.0000	17.93
0.0099	0.00	2.5000	1.94	72.0000	18.14
0.0133	0.00	3.0000	2.21	74.0000	18.30
0.0166	0.00	3.5000	2.41	76.0000	18.26
0.0200	0.00	4.0000	2.58	78.0000	18.20
0.0233	0.00	4.5000	2.73	80.0000	18.29
0.0266	0.00	5.0000	2.87	82.0000	18.01
0.0300	0.00	5.5000	3.01	84.0000	17.87
0.0333	0.00	6.0000	3.13	86.0000	17.57
0.0366	0.00	6.5000	3.25	88.0000	17.30
0.0400	0.00	7.0000	3.34	90.0000	16.94
0.0433	0.00	7.5000	3.42	92.0000	16.68
0.0466	0.00	8.0000	3.50	94.0000	16.74
0.0500	0.01	8.5000	3.57	96.0000	16.81
0.0533	0.01	9.0000	3.62	98.0000	16.69
0.0566	0.01	9.5000	3.66	100.0000	16.51
0.0600	0.01	10.0000	3.71	110.0000	15.11
0.0633	0.01	12.0000	3.97	120.0000	15.52
0.0666	0.02	14.0000	4.17	130.0000	16.47
0.0700	0.02	16.0000	4.34	140.0000	16.04
0.0733	0.02	18.0000	4.49	150.0000	15.19
0.0766	0.03	20.0000	5.05	160.0000	15.17
0.0800	0.03	22.0000	6.04	170.0000	14.95
0.0833	0.04	24.0000	6.86	180.0000	15.08
0.0866	0.04	26.0000	7.40	190.0000	14.88
0.0900	0.05	28.0000	7.83	200.0000	14.46

884160020

210.000	14.34	670.000	12.29
220.000	14.26	680.000	12.35
230.000	14.34	690.000	12.23
240.000	14.61	700.000	12.30
250.000	14.89	710.000	12.38
260.000	15.00	720.000	12.50
270.000	14.41	730.000	12.48
280.000	14.06	740.000	12.39
290.000	13.70	750.000	12.34
300.000	13.52	760.000	12.51
310.000	13.44	770.000	12.67
320.000	13.41	780.000	12.81
330.000	13.61	790.000	12.79
340.000	13.70	800.000	12.79
350.000	13.88	810.000	12.78
360.000	13.96	820.000	12.91
370.000	13.80	830.000	12.98
380.000	13.32	840.000	12.78
390.000	13.18	850.000	12.38
400.000	13.20	860.000	12.18
410.000	13.39	870.000	12.13
420.000	13.18	880.000	12.07
430.000	12.92	890.000	12.08
440.000	12.76	900.000	12.14
450.000	12.61	910.000	12.21
460.000	12.48	920.000	12.42
470.000	12.38	930.000	12.49
480.000	12.33	940.000	12.57
490.000	12.27	950.000	12.70
500.000	12.27	960.000	12.68
510.000	12.41	970.000	13.44
520.000	12.41	980.000	13.81
530.000	12.41	990.000	14.10
540.000	12.50	1000.00	14.40
550.000	12.51	1100.00	13.42
560.000	12.61	1200.00	17.58
570.000	12.68	1300.00	20.14
580.000	12.67	1400.00	13.66
590.000	12.70		
600.000	12.71		
610.000	12.76		
620.000	12.41		
630.000	12.35		
640.000	12.37		
650.000	12.33		
660.000	12.26		

884160021

PI-1 RECOVERY		0.3333	13.89	30.0000	0.20
SE1000B		0.4167	13.73	32.0000	0.13
Environmental Logger		0.5000	13.53	34.0000	0.10
10/20 12:33		0.5833	13.32	36.0000	0.09
		0.6667	13.13	38.0000	0.09
		0.7500	12.94	40.0000	0.09
Unit# 00797 Test# 2		0.8333	12.76	42.0000	0.10
		0.9167	12.59	44.0000	0.10
INPUT 1: Level (F) TOC		1.0000	12.45	46.0000	0.11
		1.0833	12.32	48.0000	0.11
Reference	0.00	1.1667	12.20	50.0000	0.12
Scale factor	15.02	1.2500	12.08	52.0000	0.12
Offset	0.00	1.3333	11.98	54.0000	0.13
		1.4166	11.87	56.0000	0.12
Step# 1 10/19 15:35		1.5000	11.77	58.0000	0.13
		1.5833	11.69	60.0000	0.13
Elapsed Time	Value	1.6667	11.59	62.0000	0.13
-----	-----	1.7500	11.51	64.0000	0.13
0.0000	14.18	1.8333	11.43	66.0000	0.13
0.0033	14.16	1.9167	11.34	68.0000	0.13
0.0066	14.17	2.0000	11.26	70.0000	0.13
0.0099	14.17	2.5000	10.78	72.0000	0.13
0.0133	14.17	3.0000	10.30	74.0000	0.13
0.0166	14.17	3.5000	9.77	76.0000	0.13
0.0200	14.17	4.0000	9.28	78.0000	0.13
0.0233	14.17	4.5000	8.81	80.0000	0.14
0.0266	14.17	5.0000	8.36	82.0000	0.14
0.0300	14.17	5.5000	7.93	84.0000	0.14
0.0333	14.17	6.0000	7.53	86.0000	0.14
0.0500	14.16	6.5000	7.14	88.0000	0.14
0.0666	14.15	7.0000	6.78	90.0000	0.13
0.0833	14.15	7.5000	6.43	92.0000	0.14
0.1000	14.14	8.0000	6.11	94.0000	0.14
0.1166	14.13	8.5000	5.79	96.0000	0.14
0.1333	14.13	9.0000	5.50	98.0000	0.14
0.1500	14.12	9.5000	5.22		
0.1666	14.10	10.0000	4.96		
0.1833	14.08	12.0000	4.03		
0.2000	14.07	14.0000	3.22		
0.2166	14.06	16.0000	2.54		
0.2333	14.04	18.0000	1.98		
0.2500	14.02	20.0000	1.52		
0.2666	14.00	22.0000	1.13		
0.2833	13.98	24.0000	0.82		
0.3000	13.95	26.0000	0.54		
0.3166	13.92	28.0000	0.32		

884160022

MW-9 DRAWDOWN		0.3333	-0.00	30.0000	0.13
		0.4167	-0.00	32.0000	0.12
SE1000B		0.5000	-0.01	34.0000	0.13
Environmental Logger		0.5833	-0.00	36.0000	0.13
10/20 12:16		0.6667	0.00	38.0000	0.13
		0.7500	-0.00	40.0000	0.13
Unit# 00797 Test# 2		0.8333	0.00	42.0000	0.14
		0.9167	0.00	44.0000	0.15
INPUT 2: Level (F) TOC		1.0000	0.00	46.0000	0.14
		1.0833	0.00	48.0000	0.15
Reference	0.00	1.1667	0.00	50.0000	0.17
Scale factor	19.96	1.2500	0.01	52.0000	0.17
Offset	0.00	1.3333	0.01	54.0000	0.17
		1.4166	0.01	56.0000	0.17
Step# 0 10/18 15:23		1.5000	0.01	58.0000	0.16
		1.5833	0.02	60.0000	0.16
Elapsed Time	Value	1.6667	0.02	62.0000	0.16
-----	-----	1.7500	0.03	64.0000	0.15
0.0000	-0.00	1.8333	0.02	66.0000	0.16
0.0033	-0.01	1.9167	0.03	68.0000	0.16
0.0066	-0.00	2.0000	0.03	70.0000	0.16
0.0099	-0.01	2.5000	0.05	72.0000	0.17
0.0133	-0.00	3.0000	0.05	74.0000	0.15
0.0166	-0.00	3.5000	0.06	76.0000	0.15
0.0200	-0.00	4.0000	0.06	78.0000	0.15
0.0233	-0.00	4.5000	0.07	80.0000	0.15
0.0266	-0.01	5.0000	0.08	82.0000	0.15
0.0300	-0.00	5.5000	0.07	84.0000	0.15
0.0333	-0.00	6.0000	0.08	86.0000	0.15
0.0500	-0.00	6.5000	0.08	88.0000	0.15
0.0666	-0.01	7.0000	0.07	90.0000	0.15
0.0833	-0.00	7.5000	0.08	92.0000	0.15
0.1000	-0.00	8.0000	0.08	94.0000	0.16
0.1166	-0.00	8.5000	0.08	96.0000	0.16
0.1333	-0.01	9.0000	0.09	98.0000	0.17
0.1500	-0.00	9.5000	0.08	100.000	0.17
0.1666	-0.00	10.0000	0.08	110.000	0.17
0.1833	-0.00	12.0000	0.09	120.000	0.16
0.2000	-0.00	14.0000	0.10	130.000	0.16
0.2166	-0.00	16.0000	0.10	140.000	0.16
0.2333	-0.00	18.0000	0.10	150.000	0.17
0.2500	-0.00	20.0000	0.11	160.000	0.15
0.2666	-0.00	22.0000	0.11	170.000	0.16
0.2833	-0.00	24.0000	0.12	180.000	0.15
0.3000	-0.00	26.0000	0.12	190.000	0.15
0.3166	-0.01	28.0000	0.13	200.000	0.14

210.000	0.15	670.000	0.19
220.000	0.15	680.000	0.20
230.000	0.15	690.000	0.20
240.000	0.15	700.000	0.20
250.000	0.15	710.000	0.20
260.000	0.16	720.000	0.20
270.000	0.16	730.000	0.20
280.000	0.15	740.000	0.20
290.000	0.15	750.000	0.21
300.000	0.16	760.000	0.20
310.000	0.16	770.000	0.21
320.000	0.16	780.000	0.20
330.000	0.16	790.000	0.21
340.000	0.16	800.000	0.21
350.000	0.17	810.000	0.20
360.000	0.17	820.000	0.21
370.000	0.17	830.000	0.21
380.000	0.17	840.000	0.22
390.000	0.17	850.000	0.22
400.000	0.17	860.000	0.22
410.000	0.17	870.000	0.20
420.000	0.17	880.000	0.22
430.000	0.18	890.000	0.21
440.000	0.17	900.000	0.21
450.000	0.17	910.000	0.22
460.000	0.17	920.000	0.20
470.000	0.17	930.000	0.22
480.000	0.18	940.000	0.22
490.000	0.18	950.000	0.22
500.000	0.17	960.000	0.22
510.000	0.17	970.000	0.23
520.000	0.18	980.000	0.24
530.000	0.17	990.000	0.24
540.000	0.17	1000.00	0.25
550.000	0.18	1100.00	0.26
560.000	0.18	1200.00	0.28
570.000	0.18	1300.00	0.30
580.000	0.18	1400.00	0.29
590.000	0.18		
600.000	0.18		
610.000	0.19		
620.000	0.20		
630.000	0.18		
640.000	0.18		
650.000	0.19		
660.000	0.20		

MW-9 RECOVERY		0.3333	0.29	30.0000	0.17
		0.4167	0.29	32.0000	0.17
SE1000B		0.5000	0.29	34.0000	0.17
Environmental Logger		0.5833	0.29	36.0000	0.15
10/20 12:28		0.6667	0.29	38.0000	0.15
		0.7500	0.29	40.0000	0.15
Unit# 00797	Test# 2	0.8333	0.29	42.0000	0.15
		0.9167	0.29	44.0000	0.15
INPUT 2: Level (F) TOC		1.0000	0.28	46.0000	0.15
		1.0833	0.29	48.0000	0.15
Reference	0.00	1.1667	0.29	50.0000	0.15
Scale factor	19.96	1.2500	0.28	52.0000	0.15
Offset	0.00	1.3333	0.29	54.0000	0.13
		1.4166	0.29	56.0000	0.15
Step# 1	10/19 15:35	1.5000	0.29	58.0000	0.15
		1.5833	0.28	60.0000	0.15
Elapsed Time	Value	1.6667	0.29	62.0000	0.15
-----	-----	1.7500	0.28	64.0000	0.15
0.0000	0.29	1.8333	0.28	66.0000	0.15
0.0033	0.28	1.9167	0.29	68.0000	0.15
0.0066	0.28	2.0000	0.29	70.0000	0.14
0.0099	0.29	2.5000	0.28	72.0000	0.15
0.0133	0.29	3.0000	0.28	74.0000	0.14
0.0166	0.29	3.5000	0.28	76.0000	0.15
0.0200	0.29	4.0000	0.27	78.0000	0.15
0.0233	0.29	4.5000	0.27	80.0000	0.14
0.0266	0.29	5.0000	0.26	82.0000	0.14
0.0300	0.27	5.5000	0.25	84.0000	0.14
0.0333	0.29	6.0000	0.25	86.0000	0.15
0.0500	0.29	6.5000	0.25	88.0000	0.15
0.0666	0.29	7.0000	0.25	90.0000	0.14
0.0833	0.29	7.5000	0.25	92.0000	0.14
0.1000	0.29	8.0000	0.24	94.0000	0.14
0.1166	0.29	8.5000	0.24	96.0000	0.15
0.1333	0.29	9.0000	0.24	98.0000	0.13
0.1500	0.29	9.5000	0.24		
0.1666	0.29	10.0000	0.22		
0.1833	0.29	12.0000	0.22		
0.2000	0.29	14.0000	0.21		
0.2166	0.29	16.0000	0.20		
0.2333	0.29	18.0000	0.18		
0.2500	0.29	20.0000	0.18		
0.2666	0.29	22.0000	0.18		
0.2833	0.29	24.0000	0.18		
0.3000	0.29	26.0000	0.17		
0.3166	0.29	28.0000	0.17		

884160025

FIGURE B-1
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft.)

PI-1 & MW-3

8

10

884160026

20

1E-1

1

10

100

1000

Distance (ft.)

RESULTS Straight-line Analysis
Transmissivity = 4.800E+02 GAL/DAY/FOOT
Storativity = 1.69E-03
 $r(\theta) 2.310E+02$ Slope = 4.480

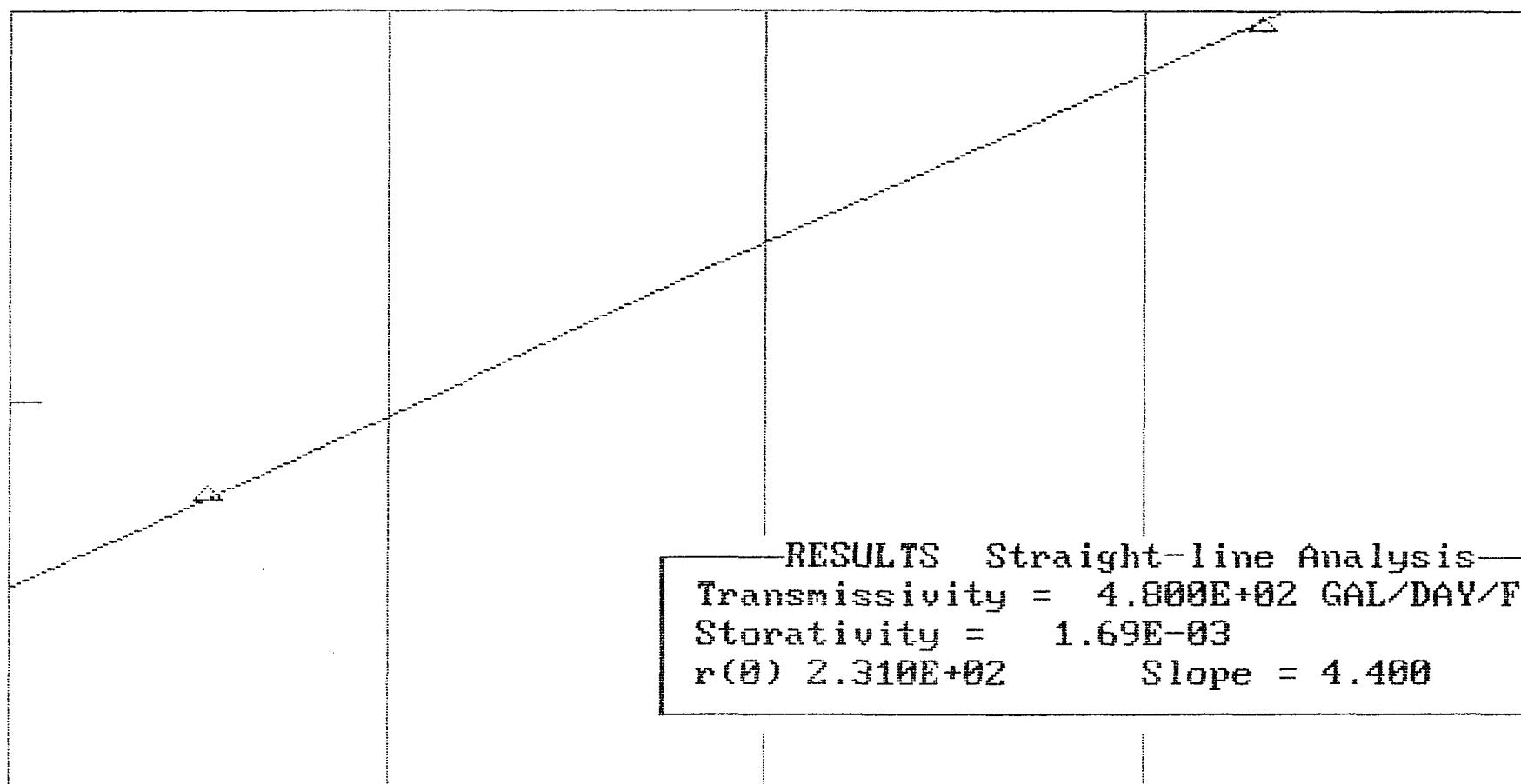


FIGURE B-2
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-5

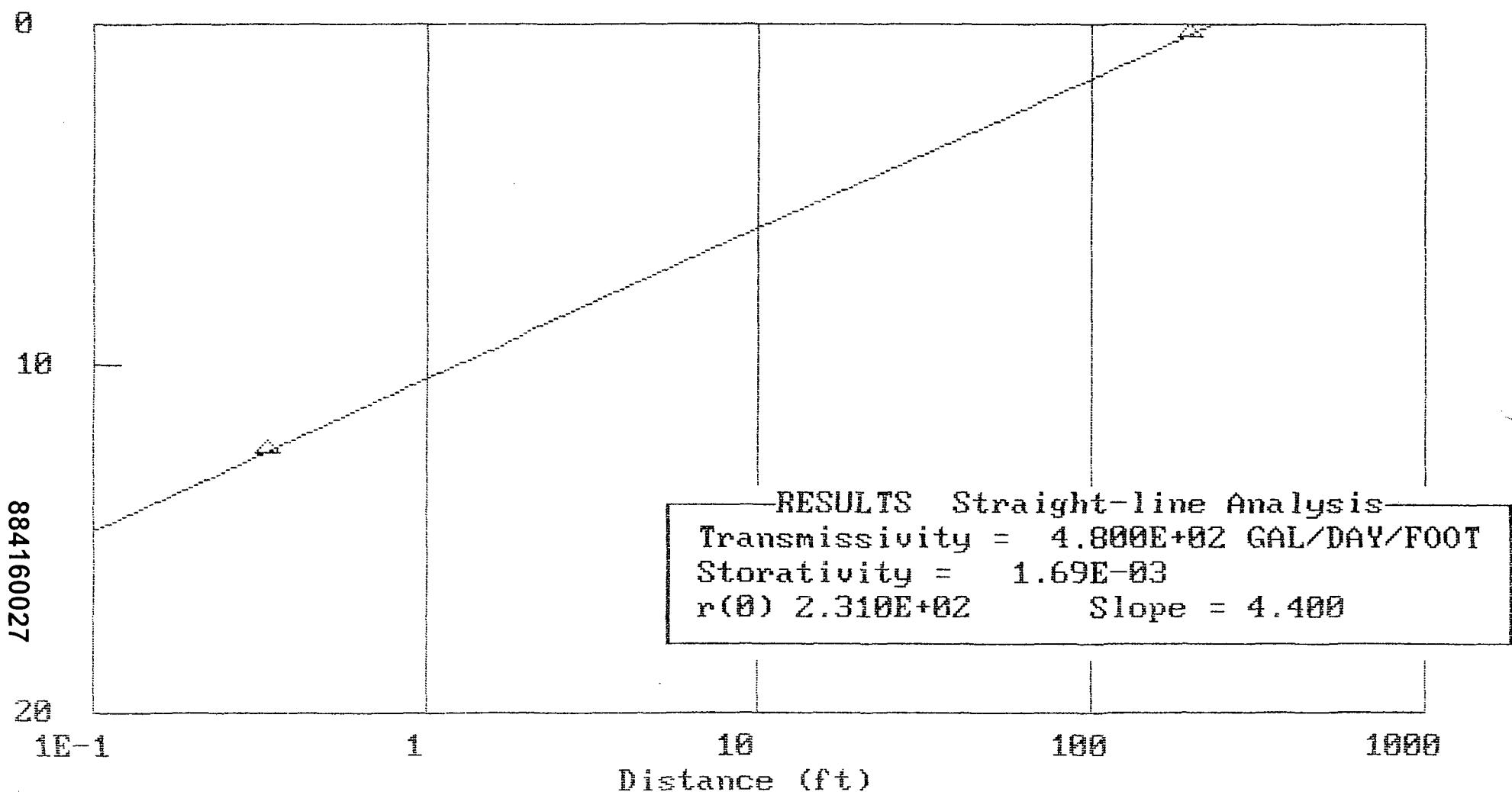


FIGURE B-3
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-9

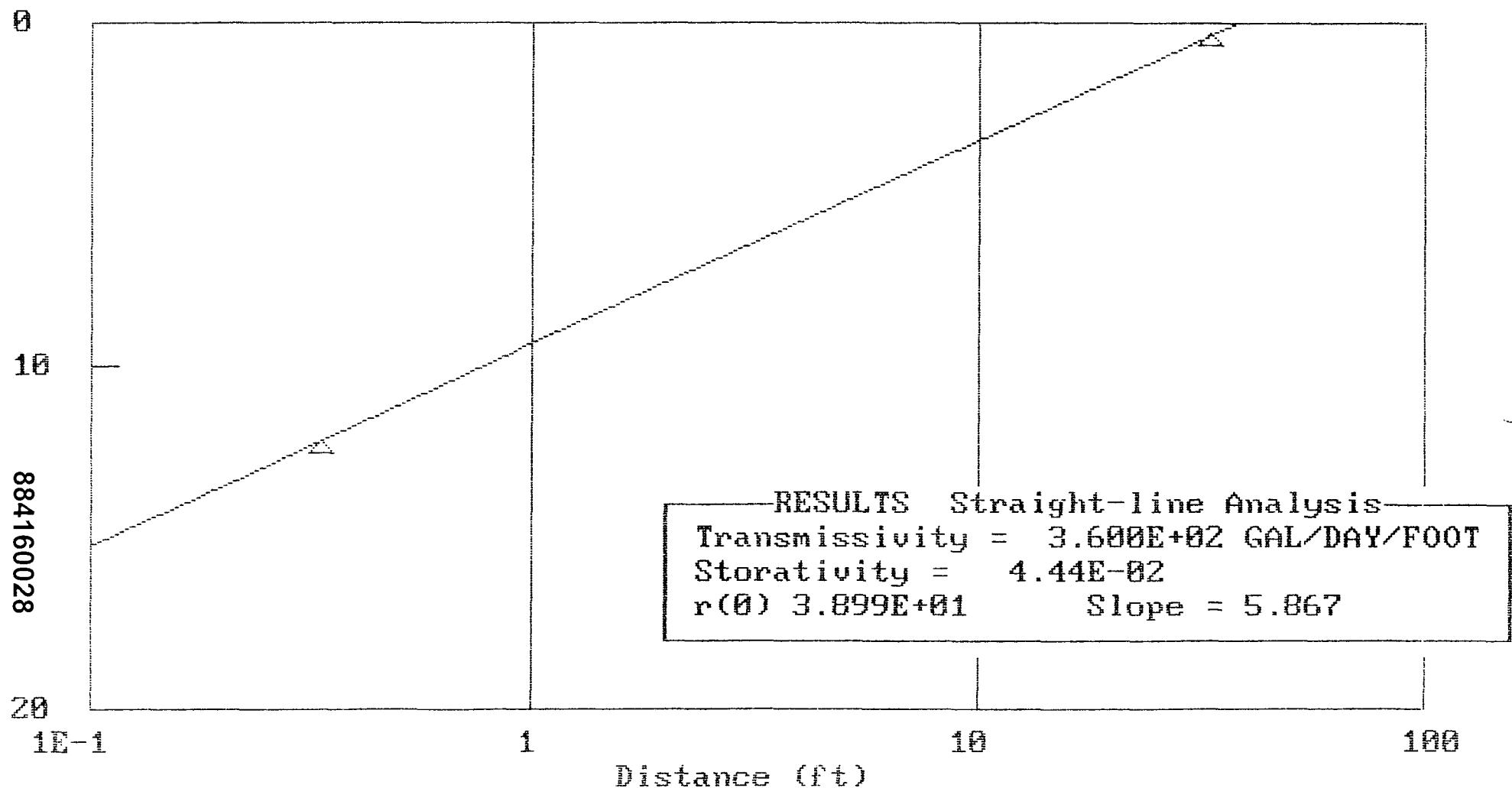


FIGURE B-4
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-11

0

10

884160029

20

1E-1

1

10

100

1000

Distance (ft)

RESULTS Straight-line Analysis

Transmissivity = 4.800E+02 GAL/DAY/FOOT
Storativity = 1.69E-03
 $r(0) 2.310E+02$ Slope = 4.400

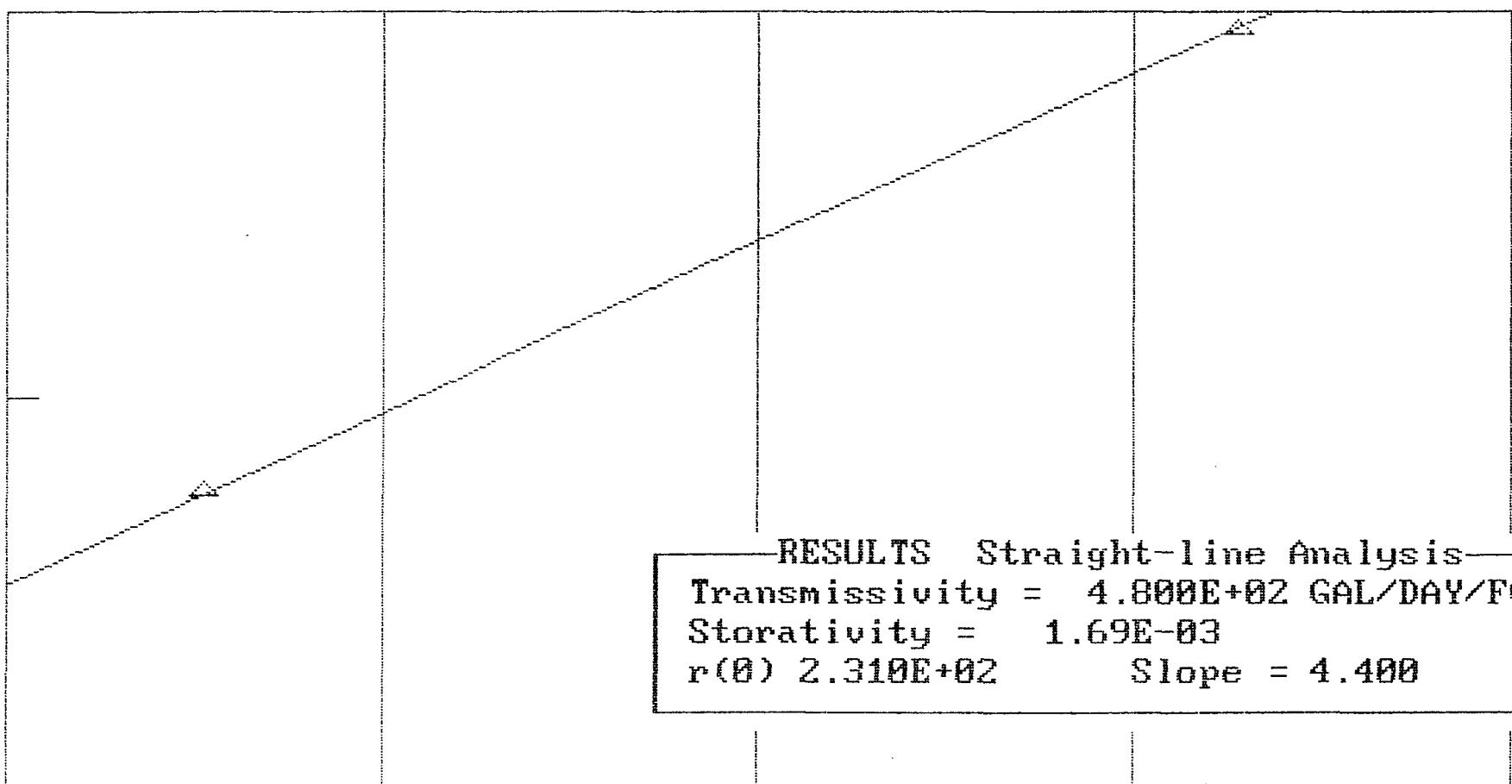


FIGURE B-5
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-13

8

10

884160030

20

1E-1

1

10

100

Distance (ft)

RESULTS Straight-line Analysis
Transmissivity = 4.488E+02 GAL/DAY/FOOT
Storativity = 5.62E-03
 $r(0) 1.212E+02$ Slope = 4.800

FIGURE B-6
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-15

0

10

884160031

20

1E-1

1

10

100

1000

Distance (ft)

RESULTS Straight-line Analysis

Transmissivity = 5.029E+02 GAL/DAY/FOOT

Storativity = 1.31E-03

r(0) 2.683E+02

Slope = 4.200

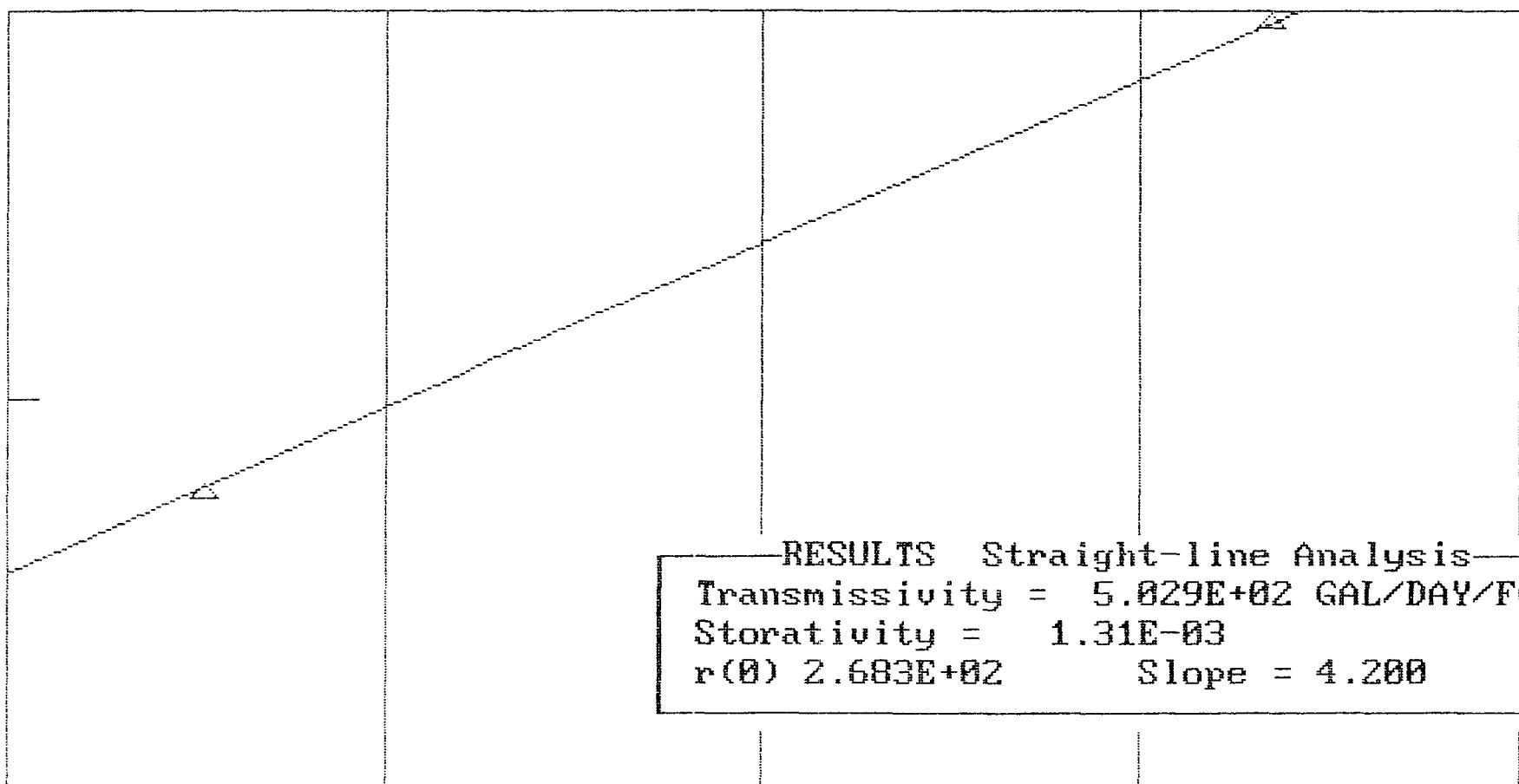


FIGURE B-7
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PI-1 & MW-19

0

10

884160032

20

1E-1

1

10

100

1000

Distance (ft)

RESULTS Straight-line Analysis

Transmissivity = 5.288E+02 GAL/DAY/FOOT

Storativity = 6.25E-04

$r(0) 3.981E+02$ Slope = 4.000

FIGURE B-8
Distance-Drawdown Graph
(after 900 minutes)

Drawdown (ft)

PILOT WELL PUMP TEST

0

10

20

1E-1

1

10

100

1000

Distance (ft)

RESULTS Straight-line Analysis

Transmissivity = 5.280E+03 GAL/DAY/FOOT

Storativity = 9.90E-04

r(0) 1.000E+03 Slope = 0.400

884160033

APPENDIX C

**FIGURES C-1 AND C-2
TIME-DRAWDOWN GRAPHS**

92RB2025.T1

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FIGURE C-1
Time-Drawdown Graph
Slope #1

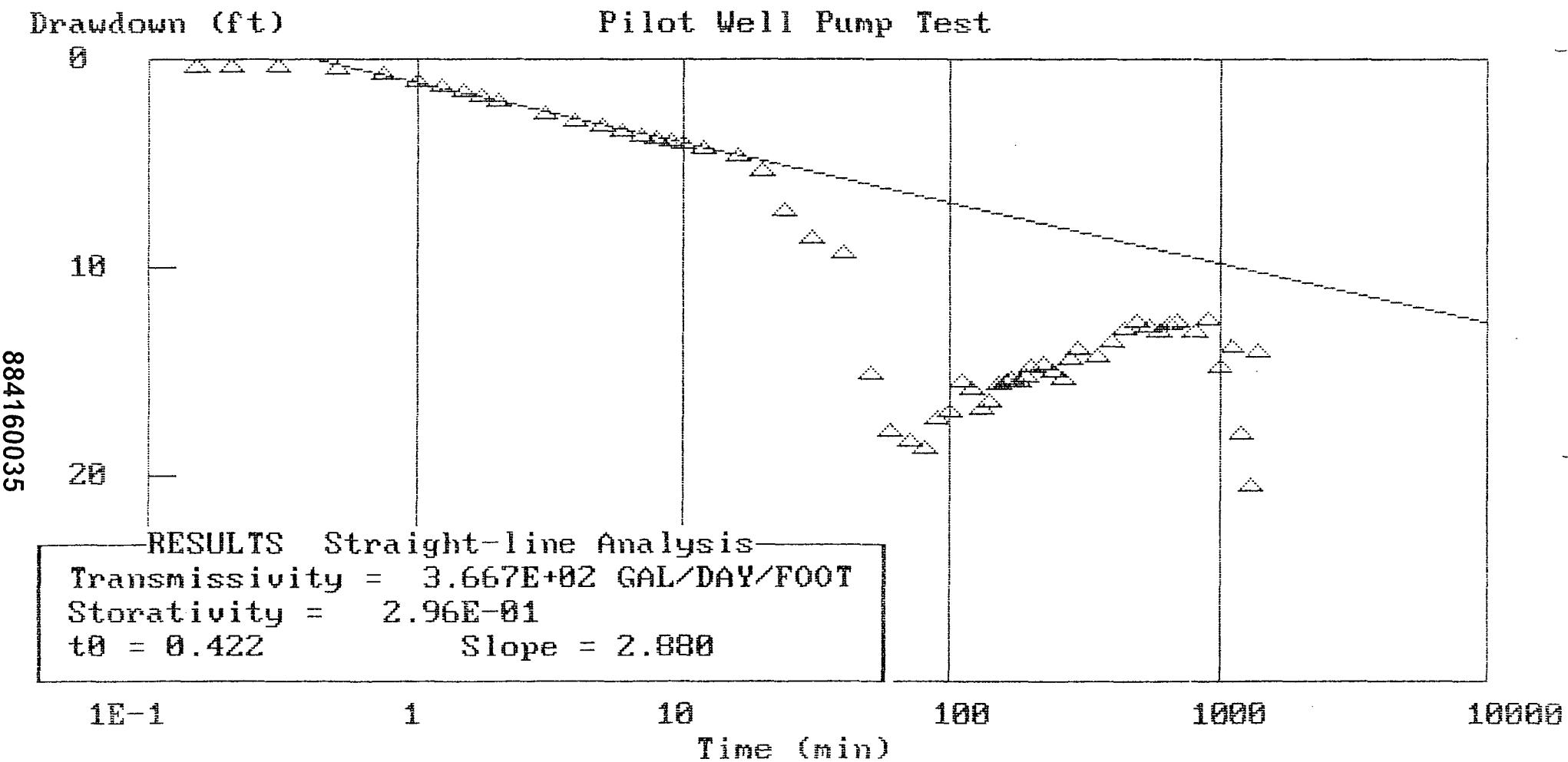
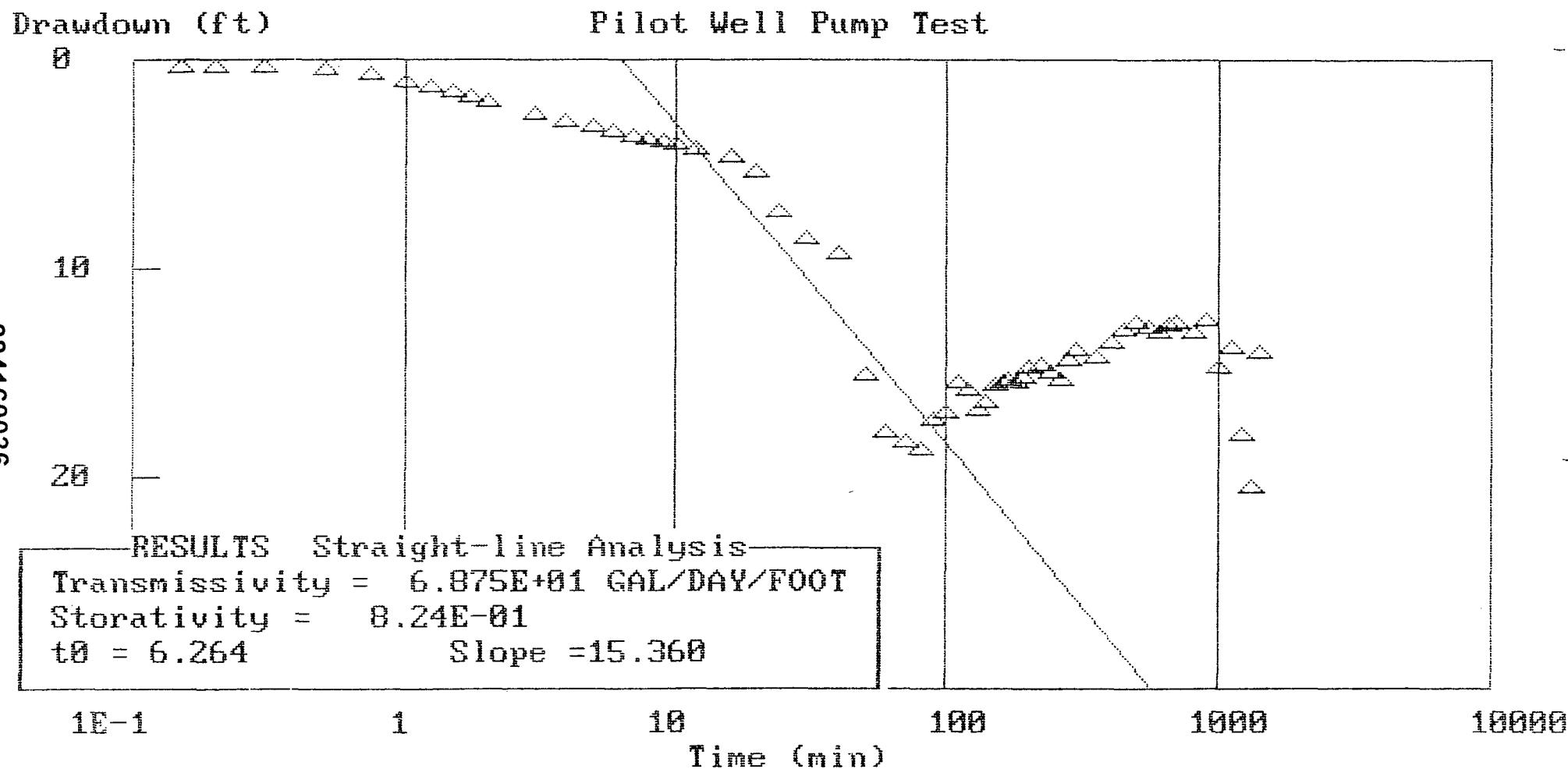


FIGURE C-2
Time-Drawdown Graph
Slope #2

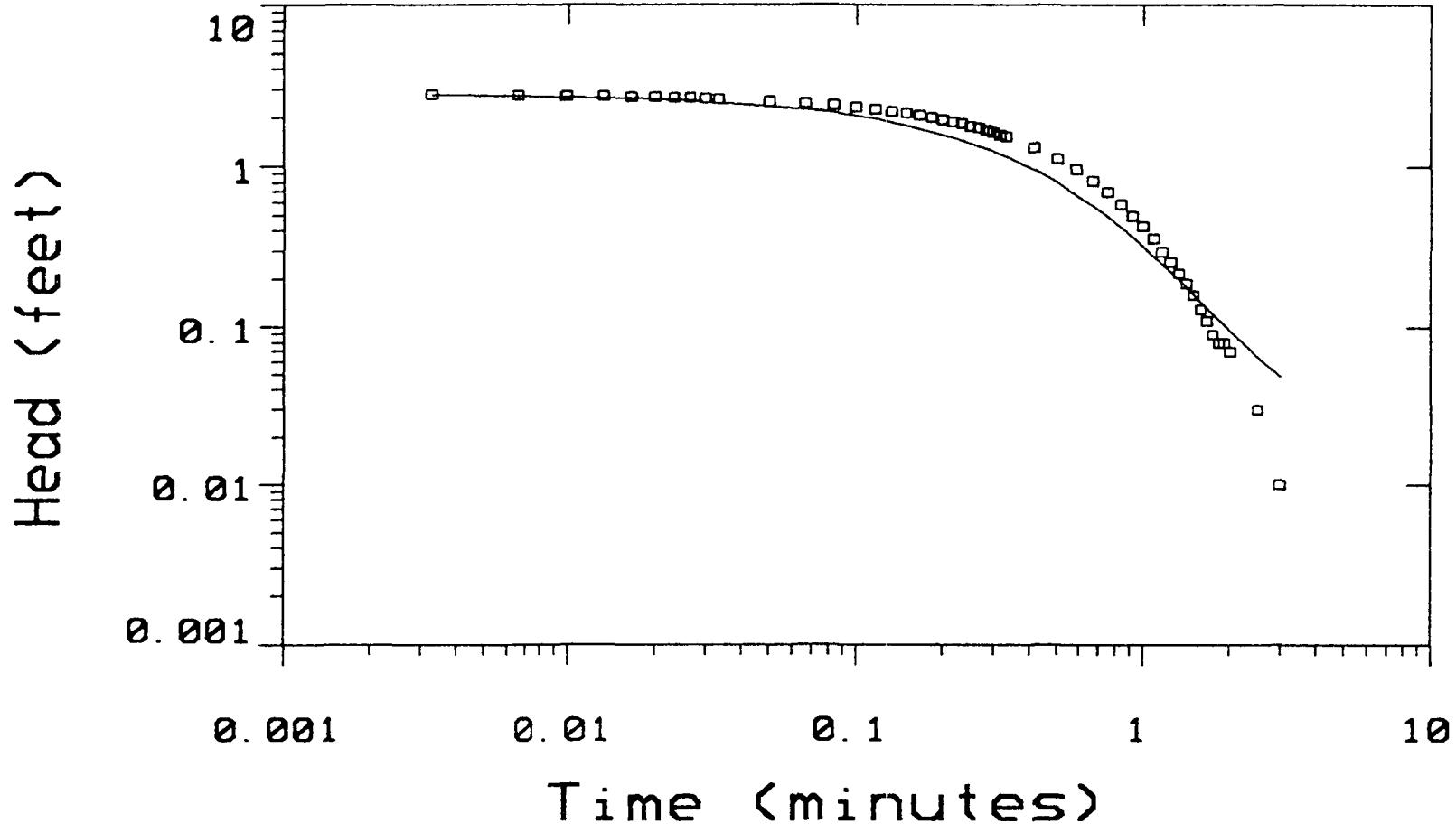


APPENDIX D

SLUG TESTS RECOVERY CURVES

92RB2025.T1

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884160038

MODEL TYPE: COOPER et al.	for: HEXCEL
TRANSMISSIVITY: .2055 sq. ft/min	by: HERITAGE REMEDIATION/ENGINEERING
STORATIVITY: 1.000E-5	WELL DATA: Units: ft
INITIAL HEAD: 2.810 ft	AQUIFER: Endless
Data Set: HEXMW03	THICKNESS: 10.00
Date: 15-OCT-91	SCREEN: top: 22.50 base: 27.50
	DIAMETER: casing: .3400 intake: 1.000
	DEPTH: Water Table: 10.46 TD: 27.50

Well Slug Test Data

Well: MW-3
LODI, NJ
Bergen Co.

DATA SET: HEXMW03

CLIENT: HEXCEL	DATE: 15-OCT-91
LOCATION: LODI, NJ	WELL NO.: MW-3
COUNTY: Bergen Co.	WELL DEPTH: 27.50 ft
PROJECT: Well Slug Test Data	WATER TABLE: 10.460 ft
AQUIFER: Endless	THICKNESS: 10.00 ft
INTAKE RADIUS: 0.500 ft	CASING RADIUS: 0.170 ft
SCREEN TOP: 22.500 ft	SCREEN BASE: 27.50 ft
INITIAL HEAD: 2.810 ft	TRANS. RATIO: 1.0000

FITTING ERROR: 38.699 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0000100	FIXED
TRANSMISSIVITY: 0.20555 square ft/min	FREE
MODEL TYPE: CONFINED AQUIFER (Cooper et al.)	

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.00330	2.78	2.75	0.794
2	0.00660	2.76	2.73	0.984
3	0.00990	2.74	2.68	2.07
4	0.0133	2.73	2.65	2.76
5	0.0166	2.71	2.63	2.87
6	0.0200	2.70	2.60	3.41
7	0.0233	2.68	2.58	3.69
8	0.0266	2.67	2.55	4.47
9	0.0300	2.65	2.51	4.98
10	0.0333	2.63	2.48	5.43
11	0.0500	2.54	2.35	7.12
12	0.0666	2.47	2.25	8.69
13	0.0833	2.41	2.15	10.44
14	0.100	2.34	2.06	11.91
15	0.116	2.27	1.96	13.38
16	0.133	2.20	1.87	14.76
17	0.150	2.14	1.79	16.29
18	0.166	2.08	1.71	17.56
19	0.183	2.02	1.64	18.65
20	0.200	1.95	1.57	19.15
21	0.216	1.90	1.51	20.29

* HERITAGE REMEDIATION/ENGINEERING *

884160039

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
22	0.233	1.85	1.45	21.33
23	0.250	1.78	1.39	21.37
24	0.266	1.74	1.34	22.59
25	0.283	1.68	1.29	22.82
26	0.300	1.63	1.24	23.38
27	0.316	1.57	1.20	23.35
28	0.333	1.53	1.15	24.21
29	0.416	1.32	0.964	26.93
30	0.500	1.13	0.805	28.70
31	0.583	0.970	0.677	30.17
32	0.666	0.820	0.574	29.95
33	0.750	0.700	0.491	29.72
34	0.833	0.590	0.424	27.99
35	0.916	0.500	0.368	26.26
36	1.00	0.430	0.321	25.16
37	1.08	0.360	0.282	21.46
38	1.16	0.300	0.250	16.58
39	1.25	0.260	0.223	14.22
40	1.33	0.220	0.199	9.20
41	1.41	0.190	0.179	5.54
42	1.50	0.160	0.161	-1.11
43	1.58	0.130	0.146	-12.69
44	1.66	0.110	0.133	-21.19
45	1.75	0.0900	0.122	-35.55
46	1.83	0.0800	0.112	-40.34
47	1.91	0.0800	0.103	-29.85
48	2.00	0.0700	0.0965	-37.97
49	2.50	0.0300	0.0656	-118.7
50	3.00	0.0100	0.0490	-390.1

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

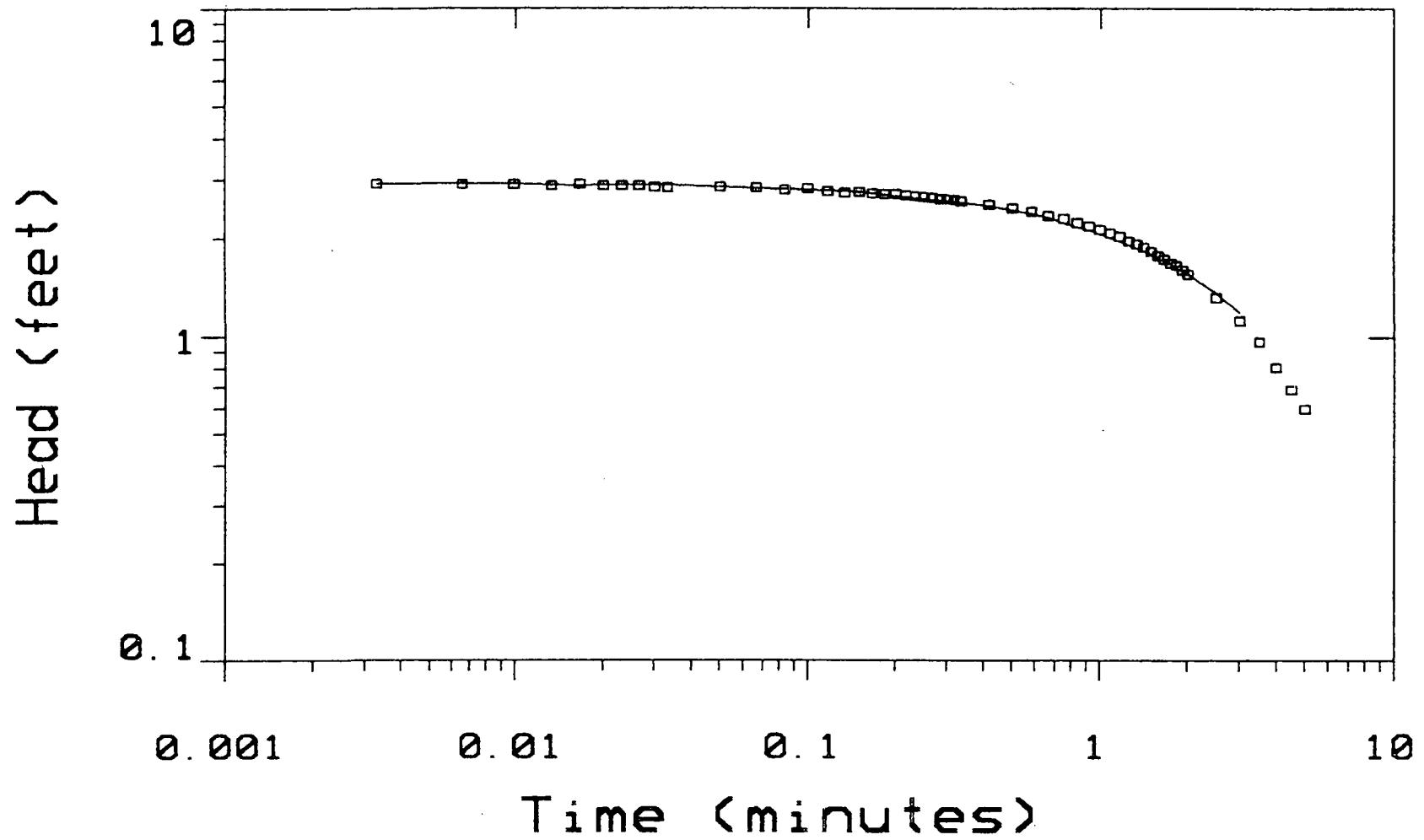
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* HERITAGE REMEDIATION/ENGINEERING *

884160040



884160041

MODEL TYPE: COOPER et al.
TRANSMISSIVITY: .02310 sq. ft/min
STORATIVITY: 1.000E-5
INITIAL HEAD: 2.930 ft

for: HEXCEL
by: HERITAGE REMEDIATION/ENGINEERING
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 10.00
SCREEN: top: 19.90 base: 24.90
DIAMETER: casing: .3400 intake: 1.000
DEPTH: Water Table: 11.47 TD: 24.90

Well Slug Test Data
Well: MW-5
LODI, NJ
Bergen Co.

Data Set: HEXMW05

Date: 15-OCT-91

DATA SET: HEXMW05

CLIENT: HEXCEL	DATE: 15-OCT-91
LOCATION: LODI, NJ	WELL NO.: MW-5
COUNTY: Bergen Co.	WELL DEPTH: 24.90 ft
PROJECT: Well Slug Test Data	WATER TABLE: 11.470 ft
AQUIFER: Endless	THICKNESS: 10.00 ft
INTAKE RADIUS: 0.500 ft	CASING RADIUS: 0.170 ft
SCREEN TOP: 19.900 ft	SCREEN BASE: 24.90 ft
INITIAL HEAD: 2.930 ft	TRANS. RATIO: 1.0000

FITTING ERROR: 1.840 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0000100 FIXED

TRANSMISSIVITY: 0.02311 square ft/min FREE

MODEL TYPE: CONFINED AQUIFER (Cooper et al.)

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
1	0.00330	2.92	2.91	0.0373
2	0.00660	2.91	2.93	-0.734
3	0.00990	2.91	2.92	-0.574
4	0.0133	2.89	2.90	-0.390
5	0.0166	2.91	2.89	0.607
6	0.0200	2.89	2.89	-0.203
7	0.0233	2.88	2.90	-0.710
8	0.0266	2.88	2.90	-0.772
9	0.0300	2.86	2.90	-1.44
10	0.0333	2.84	2.89	-2.02
11	0.0500	2.86	2.85	0.173
12	0.0666	2.84	2.82	0.464
13	0.0833	2.80	2.81	-0.627
14	0.100	2.83	2.80	0.753
15	0.116	2.78	2.79	-0.587
16	0.133	2.75	2.78	-1.09
17	0.150	2.77	2.76	0.359
18	0.166	2.74	2.73	0.0867
19	0.183	2.73	2.71	0.585
20	0.200	2.72	2.69	1.07
21	0.216	2.70	2.66	1.12

* HERITAGE REMEDIATION/ENGINEERING *

884160042

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
22	0.233	2.68	2.65	1.09
23	0.250	2.67	2.63	1.36
24	0.266	2.66	2.61	1.55
25	0.283	2.64	2.60	1.33
26	0.300	2.63	2.59	1.45
27	0.316	2.62	2.57	1.54
28	0.333	2.60	2.56	1.25
29	0.416	2.54	2.50	1.31
30	0.500	2.48	2.44	1.47
31	0.583	2.42	2.37	1.75
32	0.666	2.35	2.30	1.71
33	0.750	2.30	2.24	2.49
34	0.833	2.24	2.17	2.74
35	0.916	2.19	2.11	3.23
36	1.00	2.13	2.06	3.07
37	1.08	2.08	2.01	3.18
38	1.16	2.03	1.96	3.15
39	1.25	1.97	1.92	2.49
40	1.33	1.93	1.87	2.72
41	1.41	1.88	1.83	2.38
42	1.50	1.83	1.79	1.97
43	1.58	1.78	1.75	1.47
44	1.66	1.74	1.71	1.45
45	1.75	1.69	1.67	0.796
46	1.83	1.66	1.63	1.24
47	1.91	1.61	1.60	0.441
48	2.00	1.56	1.56	-0.469
49	2.50	1.33	1.36	-2.94
50	3.00	1.13	1.19	-5.97

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

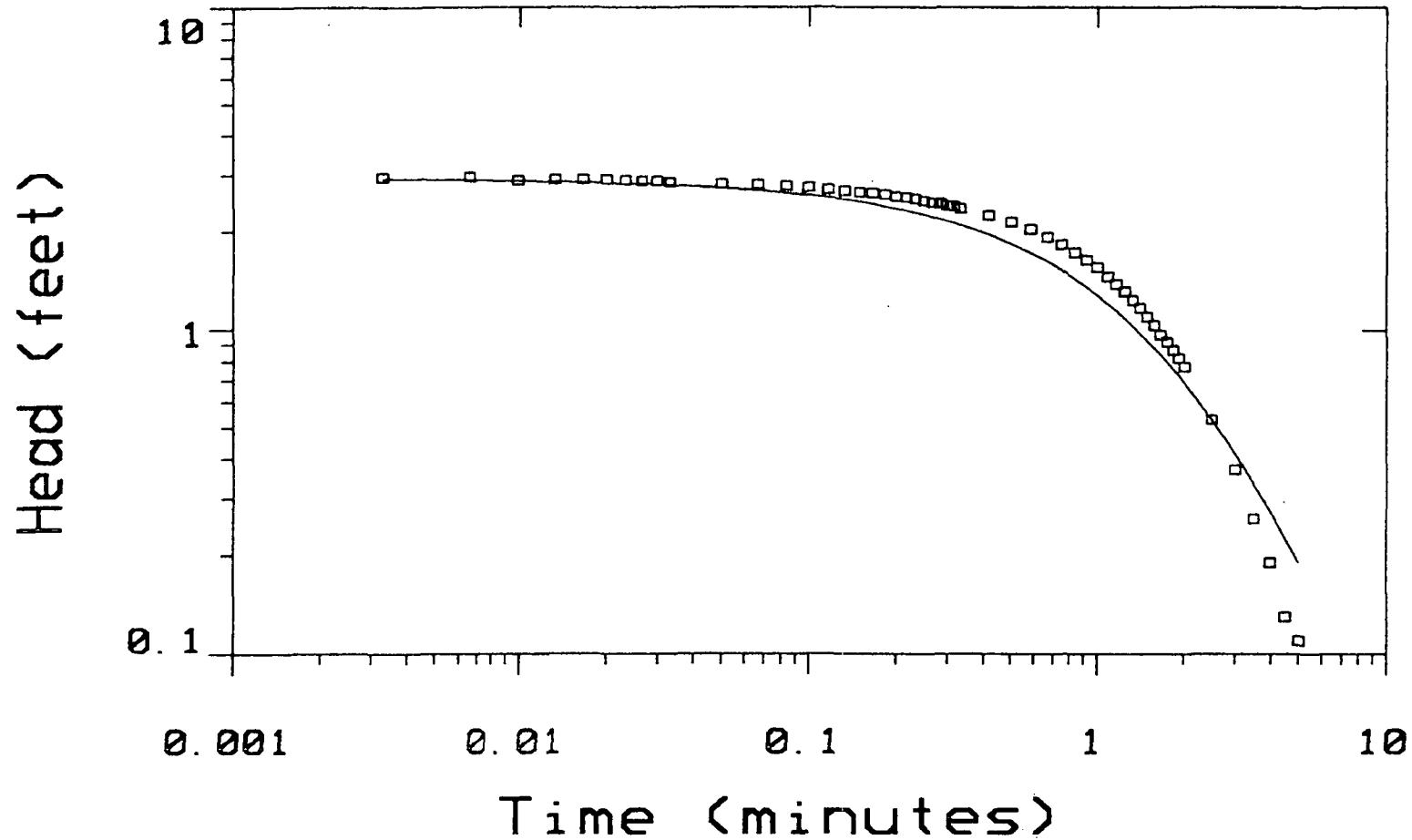
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* HERITAGE REMEDIATION/ENGINEERING *

884160043



884160044

MODEL TYPE: COOPER et al.
TRANSMISSIVITY: .04873 sq. ft/min
STORATIVITY: .0001000
INITIAL HEAD: 2.960 ft

for: HEXCEL
by: HERITAGE REMEDIATION/ENGINEERING
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 10.00
SCREEN: top: 21.80 base: 26.80
DIAMETER: casing: .3400 intake: 1.000
DEPTH: Water Table: 8.960 TD: 26.80

Data Set: HEXMW09

Date: 15-OCT-91

Well Slug Test Data
Well: MW-9
LODI, NJ
Bergen Co.

DATA SET: HEXMW09

CLIENT: HEXCEL	DATE: 15-OCT-91
LOCATION: LODI, NJ	WELL NO.: MW-9
COUNTY: Bergen Co.	WELL DEPTH: 26.80 ft
PROJECT: Well Slug Test Data	WATER TABLE: 8.960 ft
AQUIFER: Endless	THICKNESS: 10.00 ft
INTAKE RADIUS: 0.500 ft	CASING RADIUS: 0.170 ft
SCREEN TOP: 21.800 ft	SCREEN BASE: 26.80 ft
INITIAL HEAD: 2.960 ft	TRANS. RATIO: 1.0000

FITTING ERROR: 18.204 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0001000 FIXED

TRANSMISSIVITY: 0.04873 square ft/min FREE

MODEL TYPE: CONFINED AQUIFER (Cooper et al.)

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
1	0.00330	2.96	2.93	0.872
2	0.00660	2.97	2.91	1.82
3	0.00990	2.92	2.90	0.579
4	0.0133	2.93	2.88	1.48
5	0.0166	2.93	2.87	2.00
6	0.0200	2.93	2.85	2.48
7	0.0233	2.91	2.84	2.23
8	0.0266	2.90	2.83	2.28
9	0.0300	2.90	2.82	2.67
10	0.0333	2.87	2.81	2.02
11	0.0500	2.84	2.75	2.95
12	0.0666	2.82	2.70	4.14
13	0.0833	2.79	2.65	4.86
14	0.100	2.77	2.60	5.81
15	0.116	2.72	2.56	5.63
16	0.133	2.70	2.52	6.44
17	0.150	2.67	2.48	6.89
18	0.166	2.65	2.44	7.66
19	0.183	2.62	2.40	8.06
20	0.200	2.59	2.37	8.44
21	0.216	2.57	2.33	9.13

* HERITAGE REMEDIATION/ENGINEERING *

884160045

No.	TIME (mins.)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
22	0.233	2.54	2.29	9.45
23	0.250	2.51	2.26	9.74
24	0.266	2.48	2.23	9.98
25	0.283	2.46	2.19	10.57
26	0.300	2.43	2.16	10.77
27	0.316	2.41	2.13	11.31
28	0.333	2.38	2.10	11.45
29	0.416	2.26	1.96	12.94
30	0.500	2.15	1.84	14.30
31	0.583	2.04	1.72	15.27
32	0.666	1.93	1.62	15.87
33	0.750	1.83	1.52	16.54
34	0.833	1.73	1.43	16.86
35	0.916	1.64	1.35	17.31
36	1.00	1.56	1.28	17.93
37	1.08	1.46	1.20	17.12
38	1.16	1.38	1.14	17.04
39	1.25	1.31	1.08	17.22
40	1.33	1.23	1.02	16.41
41	1.41	1.17	0.975	16.61
42	1.50	1.10	0.926	15.77
43	1.58	1.04	0.880	15.31
44	1.66	0.970	0.837	13.61
45	1.75	0.920	0.798	13.25
46	1.83	0.870	0.760	12.56
47	1.91	0.820	0.725	11.50
48	2.00	0.770	0.692	10.02
49	2.50	0.530	0.531	-0.205
50	3.00	0.370	0.416	-12.63
51	3.50	0.260	0.333	-28.43
52	4.00	0.190	0.271	-42.98
53	4.50	0.130	0.225	-73.38
54	5.00	0.110	0.190	-73.58

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

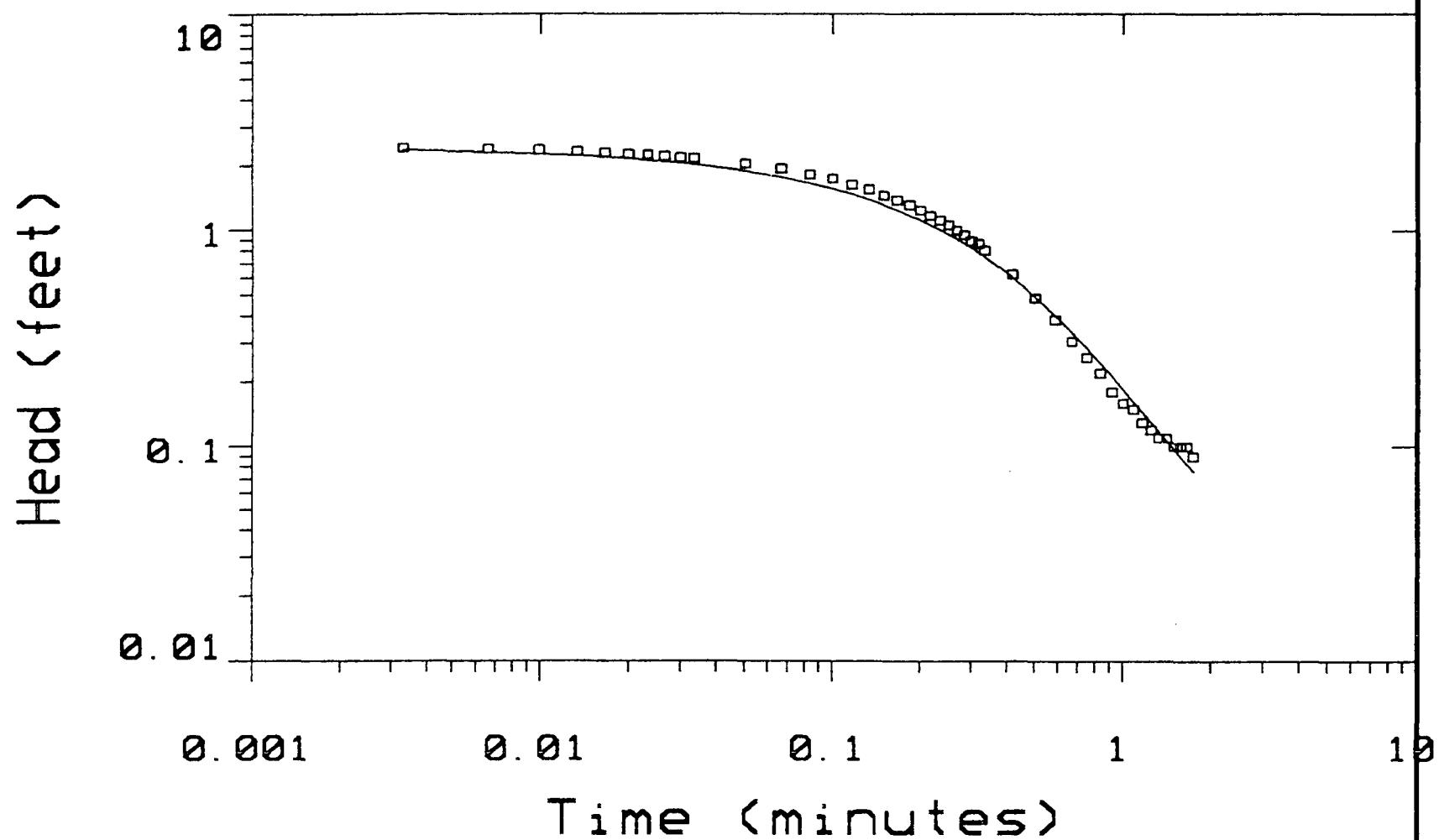
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* HERITAGE REMEDIATION/ENGINEERING *

884160046



884160047

MODEL TYPE: COOPER et al.
TRANSMISSIVITY: .2167 sq. ft/min
STORATIVITY: .0001151
INITIAL HEAD: 2.440 ft
Data Set: HEXMW11
Date: 15-OCT-91

for: HEXCEL
by: HERITAGE REMEDIATION/ENGINEERING
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 10.00
SCREEN: top: 25.40 base: 30.40
DIAMETER: casing: .3400 intake: 1.000
DEPTH: Water Table: 10.13 TD: 30.40

Well Slug Test Data

Well: MW-11
LODI, NJ
Bergen Co.

DATA SET: HEXMW11

CLIENT: HEXCEL DATE: 15-OCT-91
 LOCATION: LODI, NJ WELL NO.: MW-11
 COUNTY: Bergen Co. WELL DEPTH: 30.40 ft
 PROJECT: Well Slug Test Data WATER TABLE: 10.130 ft
 AQUIFER: Endless THICKNESS: 10.00 ft
 INTAKE RADIUS: 0.500 ft CASING RADIUS: 0.170 ft
 SCREEN TOP: 25.400 ft SCREEN BASE: 30.40 ft
 INITIAL HEAD: 2.440 ft TRANS. RATIO: 1.0000

FITTING ERROR: 9.803 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0001152 FREE

TRANSMISSIVITY: 0.21673 square ft/min FREE

MODEL TYPE: CONFINED AQUIFER (Cooper et al.)

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
1	0.00330	2.42	2.36	2.11
2	0.00660	2.40	2.32	3.19
3	0.00990	2.38	2.27	4.23
4	0.0133	2.33	2.23	3.89
5	0.0166	2.30	2.20	4.19
6	0.0200	2.27	2.16	4.47
7	0.0233	2.25	2.13	5.08
8	0.0266	2.22	2.10	5.25
9	0.0300	2.19	2.07	5.43
10	0.0333	2.17	2.04	5.95
11	0.0500	2.06	1.90	7.70
12	0.0666	1.95	1.78	8.69
13	0.0833	1.83	1.67	8.65
14	0.100	1.75	1.57	10.14
15	0.116	1.64	1.48	9.64
16	0.133	1.56	1.39	10.37
17	0.150	1.46	1.32	9.52
18	0.166	1.39	1.25	10.06
19	0.183	1.32	1.18	10.29
20	0.200	1.25	1.12	10.16
21	0.216	1.18	1.06	9.63

* HERITAGE REMEDIATION/ENGINEERING *

884160048

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
22	0.233	1.12	1.01	9.53
23	0.250	1.07	0.963	9.94
24	0.266	1.01	0.917	9.16
25	0.283	0.960	0.874	8.94
26	0.300	0.900	0.833	7.38
27	0.316	0.870	0.795	8.54
28	0.333	0.810	0.759	6.19
29	0.416	0.630	0.608	3.34
30	0.500	0.490	0.496	-1.23
31	0.583	0.390	0.409	-4.91
32	0.666	0.310	0.341	-10.15
33	0.750	0.260	0.288	-11.14
34	0.833	0.220	0.247	-12.51
35	0.916	0.180	0.213	-18.68
36	1.00	0.160	0.185	-16.21
37	1.08	0.150	0.163	-8.97
38	1.16	0.130	0.145	-11.72
39	1.25	0.120	0.130	-8.60
40	1.33	0.110	0.117	-7.05
41	1.41	0.110	0.106	2.87
42	1.50	0.100	0.0973	2.67
43	1.58	0.100	0.0891	10.87
44	1.66	0.100	0.0820	17.94
45	1.75	0.0900	0.0760	15.55

PARAMETER RESOLUTION MATRIX:

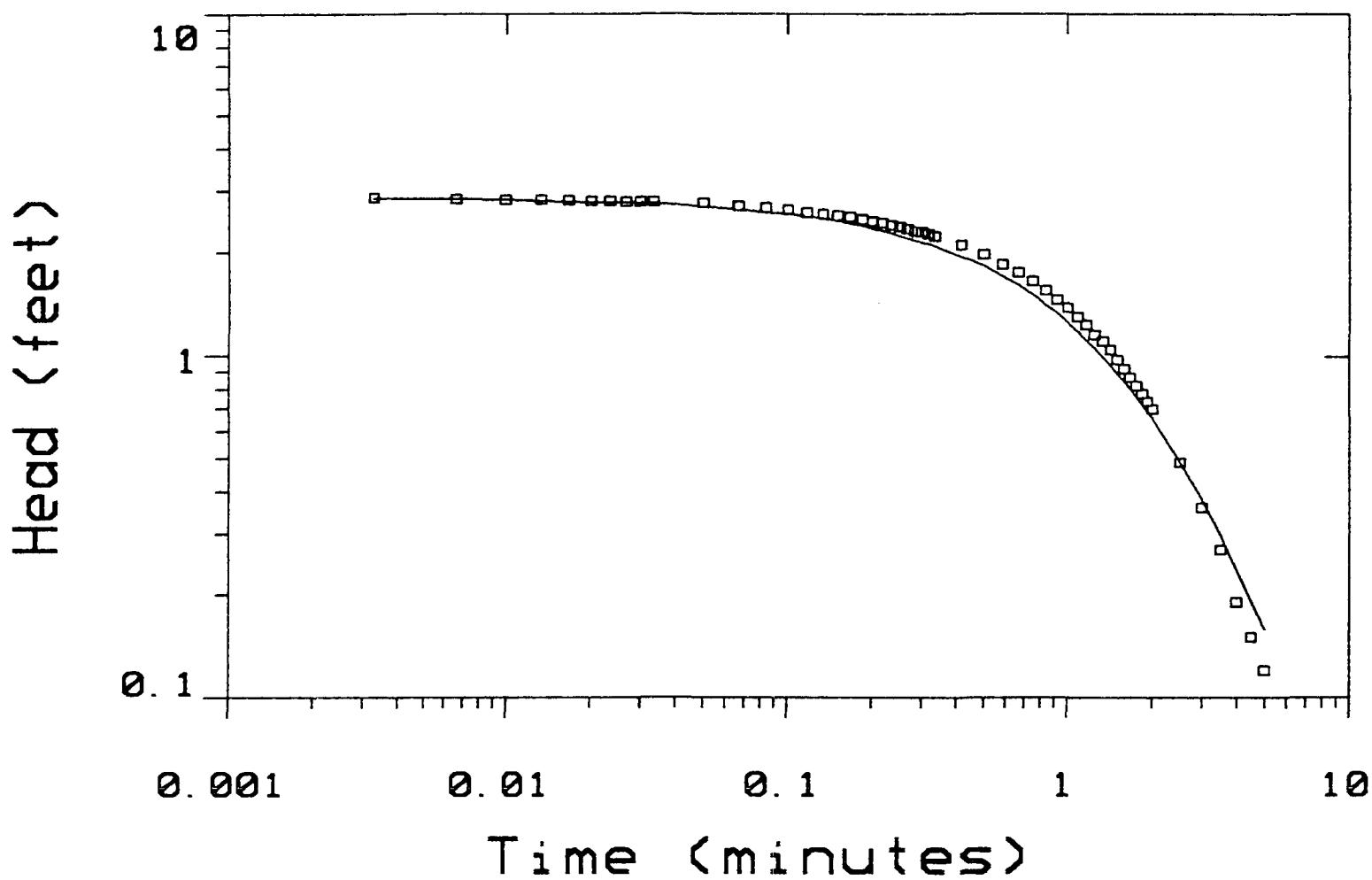
"*" INDICATES FIXED PARAMETER

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* HERITAGE REMEDIATION/ENGINEERING *

884160049



884160050

MODEL TYPE: COOPER et al.	
TRANSMISSIVITY: .06312 sq. ft/min	
STORATIVITY: 1.000E-5	
INITIAL HEAD: 2.880 ft	
Data Set: HEXMW13	Date: 15-OCT-91

for: HEXCEL
by: HERITAGE REMEDIATION/ENGINEERING
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 10.00
SCREEN: top: 24.70 base: 29.70
DIAMETER: casing: .3400 intake: 1.000
DEPTH: Water Table: 10.41 TD: 29.70

Well Slug Test Data
 Well: MW-13
 LODI, NJ
 Bergen Co.

DATA SET: HEXMW13

CLIENT: HEXCEL DATE: 15-OCT-91
 LOCATION: LODI, NJ WELL NO.: MW-13
 COUNTY: Bergen Co. WELL DEPTH: 29.70 ft
 PROJECT: Well Slug Test Data WATER TABLE: 10.410 ft
 AQUIFER: Endless THICKNESS: 10.00 ft
 INTAKE RADIUS: 0.500 ft CASING RADIUS: 0.170 ft
 SCREEN TOP: 24.700 ft SCREEN BASE: 29.70 ft
 INITIAL HEAD: 2.880 ft TRANS. RATIO: 1.0000

FITTING ERROR: 8.840 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.:	0.0000100	FIXED
TRANSMISSIVITY:	0.06312 square ft/min	FREE

MODEL TYPE: CONFINED AQUIFER (Cooper et al.)

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.00330	2.87	2.85	0.363
2	0.00660	2.86	2.85	0.160
3	0.00990	2.84	2.84	-0.316
4	0.0133	2.84	2.82	0.640
5	0.0166	2.83	2.80	0.883
6	0.0200	2.82	2.79	0.805
7	0.0233	2.82	2.79	0.984
8	0.0266	2.80	2.78	0.469
9	0.0300	2.81	2.78	1.05
10	0.0333	2.81	2.77	1.34
11	0.0500	2.78	2.71	2.46
12	0.0666	2.73	2.65	2.66
13	0.0833	2.70	2.61	3.09
14	0.100	2.66	2.57	3.01
15	0.116	2.61	2.54	2.50
16	0.133	2.59	2.50	3.15
17	0.150	2.56	2.47	3.51
18	0.166	2.54	2.43	4.29
19	0.183	2.50	2.39	4.35
20	0.200	2.46	2.35	4.39
21	0.216	2.44	2.31	5.14

* HERITAGE REMEDIATION/ENGINEERING *

884160051

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
22	0.233	2.41	2.27	5.46
23	0.250	2.38	2.24	5.71
24	0.266	2.35	2.21	5.90
25	0.283	2.32	2.17	6.04
26	0.300	2.30	2.14	6.55
27	0.316	2.27	2.11	6.61
28	0.333	2.24	2.09	6.63
29	0.416	2.11	1.95	7.22
30	0.500	1.99	1.83	7.73
31	0.583	1.86	1.72	7.39
32	0.666	1.76	1.61	8.21
33	0.750	1.66	1.51	8.70
34	0.833	1.56	1.42	8.80
35	0.916	1.47	1.33	9.04
36	1.00	1.39	1.25	9.46
37	1.08	1.31	1.18	9.46
38	1.16	1.24	1.11	9.74
39	1.25	1.16	1.05	8.85
40	1.33	1.11	0.999	9.92
41	1.41	1.05	0.946	9.87
42	1.50	0.980	0.896	8.54
43	1.58	0.920	0.849	7.65
44	1.66	0.870	0.806	7.35
45	1.75	0.820	0.765	6.65
46	1.83	0.780	0.727	6.73
47	1.91	0.740	0.691	6.50
48	2.00	0.700	0.658	5.92
49	2.50	0.490	0.494	-0.919
50	3.00	0.360	0.379	-5.30
51	3.50	0.270	0.296	-9.78
52	4.00	0.190	0.235	-23.86
53	4.50	0.150	0.190	-27.31
54	5.00	0.120	0.158	-32.29

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

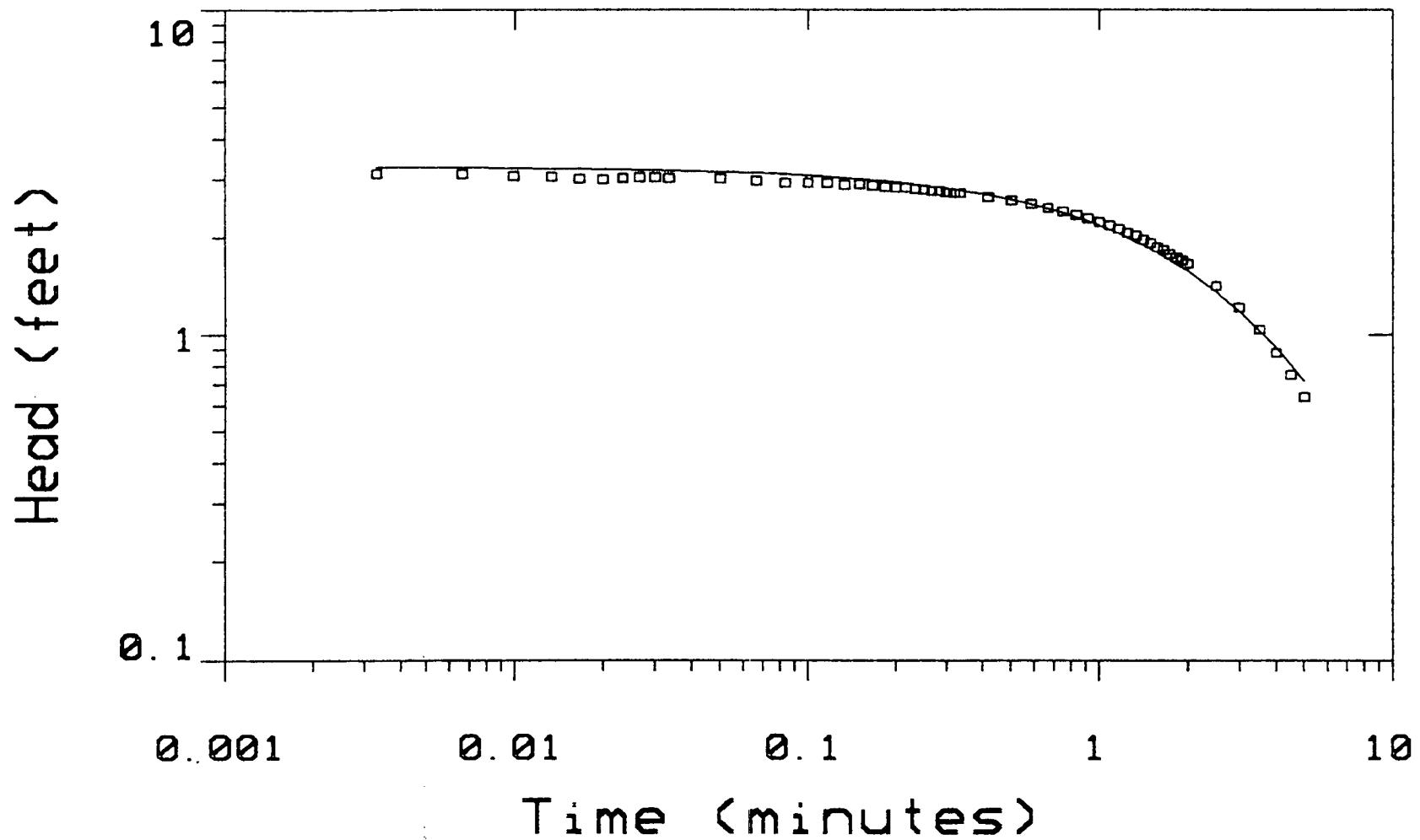
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* HERITAGE REMEDIATION/ENGINEERING *

884160052



88416053

MODEL TYPE: COOPER et al.	for: HEXCEL by: HERITAGE REMEDIATION/ENGINEERING	Well Slug Test Data
TRANSMISSIVITY: .02075 sq. ft/min	WELL DATA: Units: ft	Well: MW-15
STORATIVITY: .0001000	AQUIFER: Endless	LODI, NJ
INITIAL HEAD: 3.290 ft	THICKNESS: 10.00	Bergen Co.
Data Set: HEXMW15	SCREEN: top: 18.80 base: 22.00	
Date: 15-OCT-91	DIAMETER: casing: .3400 intake: 1.000	
	DEPTH: Water Table: 9.410 TD: 22.00	

DATA SET: HEXMW15

CLIENT: HEXCEL	DATE: 15-OCT-91
LOCATION: LODI, NJ	WELL NO.: MW-15
COUNTY: Bergen Co.	WELL DEPTH: 22.00 ft
PROJECT: Well Slug Test Data	WATER TABLE: 9.410 ft
AQUIFER: Endless	THICKNESS: 10.00 ft
INTAKE RADIUS: 0.500 ft	CASING RADIUS: 0.170 ft
SCREEN TOP: 18.800 ft	SCREEN BASE: 22.00 ft
INITIAL HEAD: 3.290 ft	TRANS. RATIO: 1.0000

FITTING ERROR: 4.604 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0001000	FIXED
TRANSMISSIVITY: 0.02076 square ft/min	FREE
MODEL TYPE: CONFINED AQUIFER (Cooper et al.)	

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
1	0.00330	3.11	3.27	-5.23
2	0.00660	3.12	3.26	-4.56
3	0.00990	3.07	3.25	-5.89
4	0.0133	3.06	3.24	-6.04
5	0.0166	3.02	3.23	-7.24
6	0.0200	3.00	3.23	-7.70
7	0.0233	3.03	3.22	-6.38
8	0.0266	3.04	3.21	-5.76
9	0.0300	3.05	3.20	-5.15
10	0.0333	3.03	3.19	-5.60
11	0.0500	3.01	3.16	-5.30
12	0.0666	2.97	3.14	-5.81
13	0.0833	2.93	3.11	-6.32
14	0.100	2.93	3.08	-5.38
15	0.116	2.93	3.06	-4.47
16	0.133	2.89	3.03	-5.02
17	0.150	2.90	3.01	-3.81
18	0.166	2.87	2.98	-4.09
19	0.183	2.85	2.96	-4.05
20	0.200	2.83	2.94	-4.02
21	0.216	2.83	2.92	-3.28

* HERITAGE REMEDIATION/ENGINEERING *

884160054

No.	TIME (mins)	Head, H (ft) DATA	Head, H (ft) SYNTHETIC	DIFFERENCE (percent)
22	0.233	2.81	2.90	-3.27
23	0.250	2.79	2.88	-3.28
24	0.266	2.77	2.86	-3.29
25	0.283	2.76	2.84	-2.94
26	0.300	2.74	2.82	-2.97
27	0.316	2.73	2.80	-2.63
28	0.333	2.72	2.78	-2.30
29	0.416	2.65	2.68	-1.47
30	0.500	2.58	2.60	-0.812
31	0.583	2.52	2.51	0.0527
32	0.666	2.45	2.44	0.344
33	0.750	2.39	2.36	0.877
34	0.833	2.34	2.30	1.70
35	0.916	2.28	2.23	2.00
36	1.00	2.23	2.17	2.63
37	1.08	2.17	2.11	2.73
38	1.16	2.12	2.05	3.18
39	1.25	2.06	1.99	3.07
40	1.33	2.02	1.94	3.81
41	1.41	1.97	1.89	4.01
42	1.50	1.92	1.84	4.11
43	1.58	1.87	1.79	4.13
44	1.66	1.83	1.74	4.58
45	1.75	1.78	1.70	4.42
46	1.83	1.74	1.65	4.71
47	1.91	1.70	1.61	4.93
48	2.00	1.66	1.57	5.07
49	2.50	1.42	1.36	4.21
50	3.00	1.22	1.18	2.99
51	3.50	1.04	1.03	0.385
52	4.00	0.880	0.911	-3.55
53	4.50	0.750	0.805	-7.45
54	5.00	0.640	0.717	-12.03

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

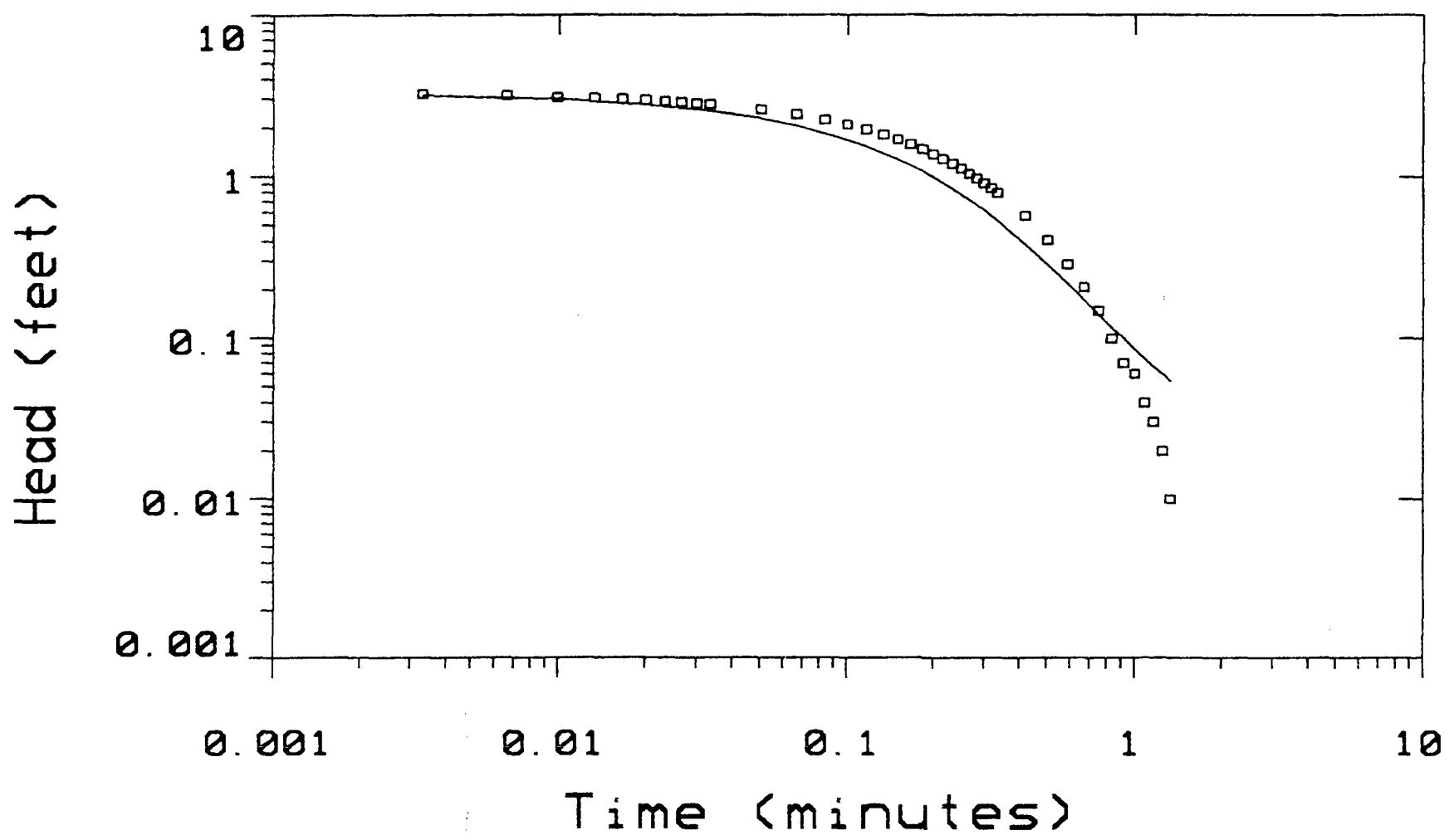
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T 0.00 1.00

S T

* HERITAGE REMEDIATION/ENGINEERING *

884160055



884160056

MODEL TYPE: COOPER et al.	
TRANSMISSIVITY: .4757 sq. ft/min	
STORATIVITY: 1.190E-5	
INITIAL HEAD: 3.270 ft	
Data Set: HEXMW19	Date: 15-OCT-91

for: HEXCEL
by: HERITAGE REMEDIATION/ENGINEERING
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 10.00
SCREEN: top: 20.00 base: 25.00
DIAMETER: casing: .3400 intake: 1.000
DEPTH: Water Table: 7.100 TD: 25.00

Well Slug Test Data
 Well: MW-19
 LODI, NJ
 Bergen Co.

DATA SET: HEXMW19

CLIENT: HEXCEL	DATE: 15-OCT-91
LOCATION: LODI, NJ	WELL NO.: MW-19
COUNTY: Bergen Co.	WELL DEPTH: 25.00 ft
PROJECT: Well Slug Test Data	WATER TABLE: 7.100 ft
AQUIFER: Endless	THICKNESS: 10.00 ft
INTAKE RADIUS: 0.500 ft	CASING RADIUS: 0.170 ft
SCREEN TOP: 20.000 ft	SCREEN BASE: 25.00 ft
INITIAL HEAD: 3.270 ft	TRANS. RATIO: 1.0000

FITTING ERROR: 54.569 PERCENT

MODEL PARAMETERS:

STORAGE COEFF.: 0.0000119 FREE

TRANSMISSIVITY: 0.47570 square ft/min FREE

MODEL TYPE: CONFINED AQUIFER (Cooper et al.)

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
1	0.00330	3.21	3.15	1.68
2	0.00660	3.15	3.05	3.03
3	0.00990	3.07	3.00	2.24
4	0.0133	3.03	2.91	3.85
5	0.0166	3.01	2.83	5.93
6	0.0200	2.95	2.75	6.53
7	0.0233	2.91	2.69	7.39
8	0.0266	2.87	2.63	8.03
9	0.0300	2.83	2.58	8.60
10	0.0333	2.79	2.53	9.07
11	0.0500	2.59	2.27	12.07
12	0.0666	2.41	2.04	15.16
13	0.0833	2.24	1.84	17.57
14	0.100	2.09	1.67	19.71
15	0.116	1.95	1.53	21.36
16	0.133	1.82	1.40	22.81
17	0.150	1.70	1.28	24.24
18	0.166	1.59	1.18	25.66
19	0.183	1.48	1.08	26.68
20	0.200	1.38	0.997	27.73
21	0.216	1.29	0.918	28.81

* HERITAGE REMEDIATION/ENGINEERING *

884160057

No.	TIME (mins)	Head, H (ft)		DIFFERENCE (percent)
		DATA	SYNTHETIC	
22	0.233	1.21	0.846	30.04
23	0.250	1.13	0.781	30.81
24	0.266	1.05	0.723	31.07
25	0.283	0.980	0.671	31.52
26	0.300	0.920	0.623	32.22
27	0.316	0.860	0.580	32.49
28	0.333	0.800	0.541	32.36
29	0.416	0.580	0.387	33.14
30	0.500	0.410	0.289	29.47
31	0.583	0.290	0.221	23.48
32	0.666	0.210	0.174	16.97
33	0.750	0.150	0.141	5.69
34	0.833	0.100	0.118	-18.08
35	0.916	0.0700	0.0999	-42.77
36	1.00	0.0600	0.0857	-42.96
37	1.08	0.0400	0.0748	-87.16
38	1.16	0.0300	0.0665	-121.7
39	1.25	0.0200	0.0600	-200.2
40	1.33	0.0100	0.0547	-447.7

PARAMETER RESOLUTION MATRIX:

"*" INDICATES FIXED PARAMETER

S 0.03

T 0.07 0.97

S T

* HERITAGE REMEDIATION/ENGINEERING *

884160058

APPENDIX E

ANALYTICAL RESULTS PRODUCTION WELL & PILOT INJECTION WELL

92RB2025.T1

884160059



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604

(201) 288-6511 FAX: (201) 288-6887

Client Name: Heritage Rem/Engineer. Date: November 8, 1991
Laboratory Project #: S-2681
Reference: Production Water Well
Location: Hexcel, Lodi, New Jersey

LABORATORY AUTHENTICATION STATEMENT

I certify that ALL-TEST ENVIRONMENTAL LABORATORIES meets the Laboratory Performance Standards and Quality Control requirements specified in N.J.A.C. 7:18, 40 CFR Part 136 for Water and Wastewater analyses and SW 846 for Solid Waste Analyses. I have personally examined and am familiar with the information contained in this report, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, complete, and meets the standards specified in N.J.A.C. 7:18, 40 CFR Part 136, and/or SW 846.

By:



A handwritten signature in black ink, appearing to read "I. Berkowitz".

Irving Berkowitz
Laboratory Manager



**ALL-TEST
ENVIRONMENTAL
LABORATORIES, INC.**

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

November 8, 1991

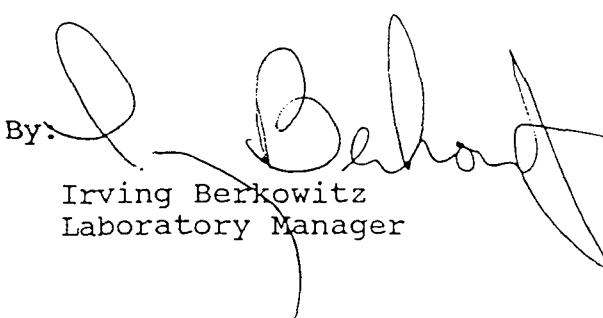
Heritage Remediation/Engineering, Inc.
Toledo Division
5656 Opportunity Drive
Toledo, Ohio 43612

Laboratory Project No. S-2681

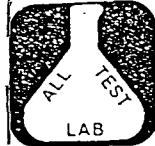
Please note the analysis on the water sample received on 10/18/91 and tested for the following:

Analysis	Results	MDL ppb
Total Cadmium	880.0 ug/l (ppb)	20
Total Chromium	39.0 ug/l (ppb)	20
Total Copper	31.0 ug/l (ppb)	20
Total Lead	ND	100
Total Arsenic	ND	5
Total Selenium	ND	5
Total Zinc	305.0 ug/l (ppb)	20
Total Mercury	ND	0.05
Iron	1.05 mg/l (ppm)	50
Potassium	3.17 mg/l (ppm)	20
Calcium	267.0 mg/l (ppm)	100
Magnesium	157.0 mg/l (ppm)	100
Carbonate	2.0 mg/l (ppm)	
Bicarbonate	177.0 mg/l (ppm)	
Sulfate	180.0 mg/l (ppm)	
Chloride	76.0 mg/l (ppm)	
pH	2.128	
Conductance	30200 micromhos/cm	
Total Alkalinity	179.0 mg/l (ppm)	
Hardness	434.0 mg/l (ppm)	

By:


Irving Berkowitz
Laboratory Manager

MDL = Method Detection Limit
ND = Non Detected (below MDL)



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data

Project No. 61026 Hexel Matrix: Water
Sample No. S-2681 Production Well Dilution Factor: 1
Client Name: Heritage Remediation Date Analyzed: 10/22/91

<u>COMPOUND</u>	<u>UG/L</u>	<u>MDL</u>
Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Trichlorofluoromethane	ND	5
1,1-Dichloroethene	ND	5
Methylene Chloride	33.96	5
Trans-1,2 Dichloroethane	ND	5
1,1 Dichloroethane	ND	5
Chloroform	ND	5
1,1,1-Trichloroethane	ND	5
Carbon Tetrachloride	ND	5
Benzene	ND	5
1,2-Dichloroethane	ND	5
Trichloroethene	11.65	5
1,2-Dichloropropene	ND	5
Bromodichloromethane	ND	5
Trans-1,3-Dichloropropene	ND	5
Toluene	ND	5
Cis-1,3-Dichloropropene	ND	5
1,1,2-Trichloroethane	ND	5
2-Chloroethyl Vinyl Ether	ND	5
Tetrachloroethene	ND **	5
Dibromochloromethane	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
m&o Xylenes	ND	10
p Xylene	ND	10
Bromoform	ND	5
1,1,2,2-Tetrachloroethane	ND	5



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data

Project No. 61026 Hexel Matrix: Water
Sample No. S-2681 Production Well Dilution Factor: 1
Client Name: Heritage Remediation Date Analyzed: 10/22/91

<u>COMPOUND</u>	<u>UG/L</u>	<u>MDL</u>
1,3-Dichlorobenzene	ND	10
1,2-Dichlorobenzene	ND	10
1,4-Dichlorobenzene	ND	10

ND = None Detected

MDL = Method Detection Limit

J = Below Method Detection Limit

** = Compound Found In Laboratory Blank

<u>SURROGATE COMPOUNDS</u>	<u>RECOVERY</u>	<u>LIMITS</u>
1,2-Dichloroethane-d4	94%	70-121
Toluene-d8	88%	81-117
4-Bromofluorobenzene	91%	74-121

By:

Irving Berkowitz
Lab Manager



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604

(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data Tentatively Identified Compounds

Project No. 61026 Hexel

Matrix: Water

Sample No. S-2681 Production Well Dilution Factor: 1

Client Name: Heritage Remediation Date Analyzed: 10/22/91

COMPOUND NAME	RT	EST. CONC.	Quality
---------------	----	------------	---------

1) UNKNOWN	2.62	186.08	0
2) Ethane, 1,1,2-trichloro-1,2,2-	5.81	45.70	91
3) Ethene, 1,2-dichloro-, (E)-	9.47	12.45	91
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			

S-2681

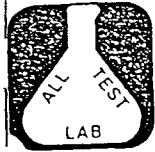
HERITAGE

HERITAGE REMEDIATION/ENGINEERING, INC.

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	NO. OF CONTAINERS						REMARKS		
61026	HEXCEL	10	15	20	15	Containers	Airions	Other		
	SAMPLERS: (Signatures)							Toledo Division • 5656 Opportunity Drive • Toledo, OH 436		
	Robert Bachelder / Keith Whaley									
STN. NO.	DATE	TIME	CONT.	GRAN.	STATION LOCATION					
1	10-18	0932	C	V	Production Well water	4	X	X	+ + + +	metals preserved with Acid Total Cadmium, Chromium, Copper, Lead, Arsenic, Selenium, Zinc, Mercury
										VO + 15 method 624
										Analyze per APE letter dated 10-17-91
Relinquished by: (Signature) <i>Robert Bachelder</i>			Date / Time 10-18-91 1120	Received by: (Signature) <i>Steve Kindred</i>	Relinquished by: (Signature) <i>Steve Kindred</i>			Date / Time 10/18 11:41 am	Received by: (Signature) <i>Sue Mandelard</i>	
Relinquished by: (Signature)			Date / Time	Received by: (Signature)	Relinquished by: (Signature)			Date / Time	Received by: (Signature)	
Relinquished by: (Signature)			Date / Time	Received for Laboratory by: (Signature)	Date / Time			Remarks		

884160065



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Client Name: Heritage Rem/Engineer. Date: November 8, 1991
Laboratory Project #: S-2683
Reference: Production Water Well
Location: Hexcel, Lodi, New Jersey

LABORATORY AUTHENTICATION STATEMENT

I certify that ALL-TEST ENVIRONMENTAL LABORATORIES meets the Laboratory Performance Standards and Quality Control requirements specified in N.J.A.C. 7:18, 40 CFR Part 136 for Water and Wastewater analyses and SW 846 for Solid Waste Analyses. I have personally examined and am familiar with the information contained in this report, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, complete, and meets the standards specified in N.J.A.C. 7:18, 40 CFR Part 136, and/or SW 846.

By:



Irving Berkowitz
Laboratory Manager



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

November 8, 1991

Heritage Remediation/Engineering, Inc.
Toledo Division
5656 Opportunity Drive
Toledo, Ohio 43612

Laboratory Project No. S-2683

Please note the analysis on the water sample received on 10/21/91 and tested for the following:

Analysis	Results	MDL ppb
Total Cadmium	1.40 mg/l (ppm)	20
Total Chromium	31.0 ug/l (ppb)	20
Total Copper	35.0 ug/l (ppb)	20
Total Lead	ND	100
Total Arsenic	ND	5
Total Selenium	ND	5
Total Zinc	4.0 mg/l (ppm)	20
Total Mercury	ND	0.05
Iron	48.5 mg/l (ppm)	500
Potassium	14.08 mg/l (ppm)	40
Calcium	262.0 mg/l (ppm)	200
Magnesium	99.0 mg/l (ppm)	200
Carbonate	2.0 mg/l (ppm)	
Bicarbonate	220.0 mg/l (ppm)	
Sulfate	96.0 mg/l (ppm)	
Chloride	70.0 mg/l (ppm)	5
pH	2.898	
Conductance	50,000 micromhos/cm	
Total Alkalinity	222.0 mg/l (ppm)	
Hardness	673.0 mg/l (ppm)	

By:


Irving Berkowitz
Laboratory Manager

MDL = Method Detection Limit
ND = Non Detected (below MDL)



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data

Project No. 61026 Hexel Matrix: Water
Sample No. S-2683 Pilot Well PW-1 Dilution Factor: 1
Client Name: Heritage Remediation Date Analyzed: 10/22/91

<u>COMPOUND</u>	<u>UG/L</u>	<u>MDL</u>
Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Trichlorofluoromethane	ND	5
1,1-Dichloroethene	ND	5
Methylene Chloride	ND	5
Trans-1,2 Dichloroethane	ND	5
1,1 Dichloroethane	ND	5
Chloroform	ND	5
1,1,1-Trichloroethane	ND	5
Carbon Tetrachloride	ND	5
Benzene	ND	5
1,2-Dichloroethane	ND	5
Trichloroethene	13.74	5
1,2-Dichloroproppane	ND	5
Bromodichloromethane	ND	5
Trans-1,3-Dichloropropene	ND	5
Toluene	6.16	5
Cis-1,3-Dichloropropene	ND	5
1,1,2-Trichloroethane	ND	5
2-Chloroethyl Vinyl Ether	ND	5
Tetrachloroethene	ND **	5
Dibromochloromethane	ND	5
Chlorobenzene	48.41	5
Ethylbenzene	ND	5
m&o Xylenes	ND	10
p Xylene	ND	10
Bromoform	ND	5
1,1,2,2-Tetrachloroethane	ND	5



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data

Project No. 61026 Hexel

Matrix: Water

Sample No. S-2683 Pilot Well PW-1 Dilution Factor: 1

Client Name: Heritage Remediation Date Analyzed: 10/22/91

<u>COMPOUND</u>	<u>UG/L</u>	<u>MDL</u>
1,3-Dichlorobenzene	ND	10
1,2-Dichlorobenzene	ND	10
1,4-Dichlorobenzene	10.44	10

ND = None Detected

MDL = Method Detection Limit

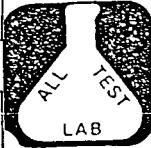
J = Below Method Detection Limit

** = Compound Found In Laboratory Blank

<u>SURROGATE COMPOUNDS</u>	<u>RECOVERY</u>	<u>LIMITS</u>
1,2-Dichloroethane-d4	108%	70-121
Toluene-d8	96%	81-117
4-Bromofluorobenzene	99%	74-121

By:

Irving Berkowitz
Lab Manager



ALL-TEST ENVIRONMENTAL LABORATORIES, INC.

60 Railroad Avenue, Hasbrouck Heights, N.J. 07604
(201) 288-6511 FAX: (201) 288-6887

Volatile Organic Analysis Data Tentatively Identified Compounds

Project No. 61026 Hexel Matrix: Water
Sample No. S-2683 Pilot Well PW-1 Dilution Factor: 1
Client Name: Heritage Remediation Date Analyzed: 10/22/91

COMPOUND NAME	RT	EST. CONC.	Quality
1) Unknown	2.48	217.03	0
2) Ethane, 1,1,2-trichloro-1,2,2-	5.53	150.70	91
3) Ethane, 1-2dichloro-, (E)-	9.12	11.61	97
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			

S-2683



CHAIN OF CUSTODY RECORD

HERITAGE REMEDIATION/ENGINEERING, INC.

PROJ. NO.	PROJECT NAME					NO. OF CONTAINERS	Toledo Division • 5656 Opportunity Drive • Toledo, OH 43612				
61026	Hexcel						Metals	KO+15	Cations/PN:52	Others	
SAMPLERS: (Signature) Robert R. Bechtel											
STA. NO.	DATE	TIME	COUP.	GRAB	STATION LOCATION					REMARKS	
1	10-21	10:00			Pilot well (PW-1)	4	X	X	X	X	Metals include total: cadmium, chromium, copper, lead, arsenic, selenium, zinc, mercury.
											VO+15 by method 624
											Other includes: pH, conductance, alkalinity, hardness
Relinquished by: (Signature) Robert R. Bechtel			Date / Time		Received by: (Signature) R. B. Bechtel		Relinquished by: (Signature)			Date / Time	Received by: (Signature)
			10-21-91 10:05								
Relinquished by: (Signature)			Date / Time		Received by: (Signature)		Relinquished by: (Signature)			Date / Time	Received by: (Signature)
Relinquished by: (Signature)			Date / Time		Received for Laboratory by: (Signature)		Date / Time	Remarks			

884160071

APPENDIX F

RESULTS FROM AQUIFER CHARACTERIZATION OF THE UPPER OVERBURDEN AQUIFER

92RB2025.T1

884160072

TABLE I
ESTIMATED SHALLOW (UPPER) AQUIFER
HYDRAULIC PROPERTIES

Well No.	HYDRAULIC CONDUCTIVITY		TRANSMISSIVITY		SPECIFIC CAPACITY		ANTICIPATED DISCHARGE RATE	
	K slug test (ft/min)	K pump test (ft/min)	T slug test (gpd/ft)	T pump test (gpd/ft)	Q/s slug test (gpm/ft)	Q/s pump test (gpm/ft)	Q slug test (gpm)	Q pump test (gpm)
CR-1	1.61 x 10 ⁻³		7.99 x 10 ¹		8.25 x 10 ⁻²		0.21	
CR-2	3.30 x 10 ⁻⁴		1.66 x 10 ¹		2.11 x 10 ⁻²		0.06	
CR-3	2.64 x 10 ⁻³		1.41 x 10 ²		1.37 x 10 ⁻¹		0.34	
CR-4	6.90 x 10 ⁻³	7.06 x 10 ⁻³	3.88 x 10 ²	3.69 x 10 ²	3.38 x 10 ⁻¹	2.31 x 10 ⁻¹	0.85	0.75
CR-5	9.11 x 10 ⁻³	3.24 x 10 ⁻³	5.37 x 10 ²	1.79 x 10 ²	4.53 x 10 ⁻¹	3.33 x 10 ⁻¹	1.13	1.25
CR-6	4.46 x 10 ⁻³		1.30 x 10 ²		1.27 x 10 ⁻¹		0.32	
CR-7	7.74 x 10 ⁻³		5.32 x 10 ²		4.50 x 10 ⁻¹		0.51	
CR-8	2.77 x 10 ⁻³	1.56 x 10 ⁻³	1.69 x 10 ²	9.86 x 10 ¹	1.61 x 10 ⁻¹	2.00 x 10 ⁻¹	0.40	0.50
CR-9	6.19 x 10 ⁻³		4.02 x 10 ²		3.48 x 10 ⁻¹		0.87	
CR-10	4.00 x 10 ⁻³		2.83 x 10 ²		2.54 x 10 ⁻¹		0.64	
CR-11	1.29 x 10 ⁻²		9.33 x 10 ²		7.44 x 10 ⁻¹		1.86	
CR-12	6.91 x 10 ⁻³		4.99 x 10 ²		4.25 x 10 ⁻¹		1.06	
CR-13	1.18 x 10 ⁻³		8.14 x 10 ¹		8.41 x 10 ⁻²		0.21	
CR-14	1.37 x 10 ⁻³	4.83 x 10 ⁻³	9.10 x 10 ¹	3.12 x 10 ¹	9.31 x 10 ⁻²	1.04 x 10 ⁻¹	0.23	0.13
CR-15	9.15 x 10 ⁻³		6.06 x 10 ²		5.05 x 10 ⁻¹		1.26	
CR-16	3.11 x 10 ⁻³		2.11 x 10 ²		1.96 x 10 ⁻¹		0.49	
CR-17	5.12 x 10 ⁻³		3.85 x 10 ²		3.35 x 10 ⁻¹		0.84	
CR-18	8.75 x 10 ⁻³		5.26 x 10 ²		4.43 x 10 ⁻¹		1.11	
CR-19	2.77 x 10 ⁻³		2.01 x 10 ²		1.87 x 10 ⁻¹		0.47	
CR-20	1.65 x 10 ⁻³		1.20 x 10 ²		1.18 x 10 ⁻¹		0.30	
CR-21	2.18 x 10 ⁻²	9.33 x 10 ⁻¹	1.52 x 10 ³	1.16 x 10 ³	1.16 x 10 ⁰	8.40 x 10 ⁻¹	2.92	2.00
CR-22	3.90 x 10 ⁻⁴		2.86 x 10 ¹		3.40 x 10 ⁻²		0.08	

K - Hydraulic Conductivity

T - Transmissivity

Q/s - Specific Capacity

Q - Discharge rate based on assumed drawdown of 2.5 feet

4.2.1 Discharge to the Upper Overburden Aquifer

Discharge to the upper overburden aquifer entails injecting pretreatment system effluent via an injection well or infiltration gallery system. The injection well system would consist of one or more wells of a specified diameter and screen length to adequately accept the discharge. Most simply, injection would be based on gravity drainage, or the head pressure created by the difference in elevation from the treatment system effluent to the ground-water surface. The well number and design is based on the hydraulic characteristics of the aquifer.

Discharge to the upper overburden aquifer via an infiltration gallery would consist of one or more lines of perforated drainage pipe. This pipe would be placed within an envelope of gravel to facilitate drainage. As with the injection well system, gravity drainage would be most simply implemented.

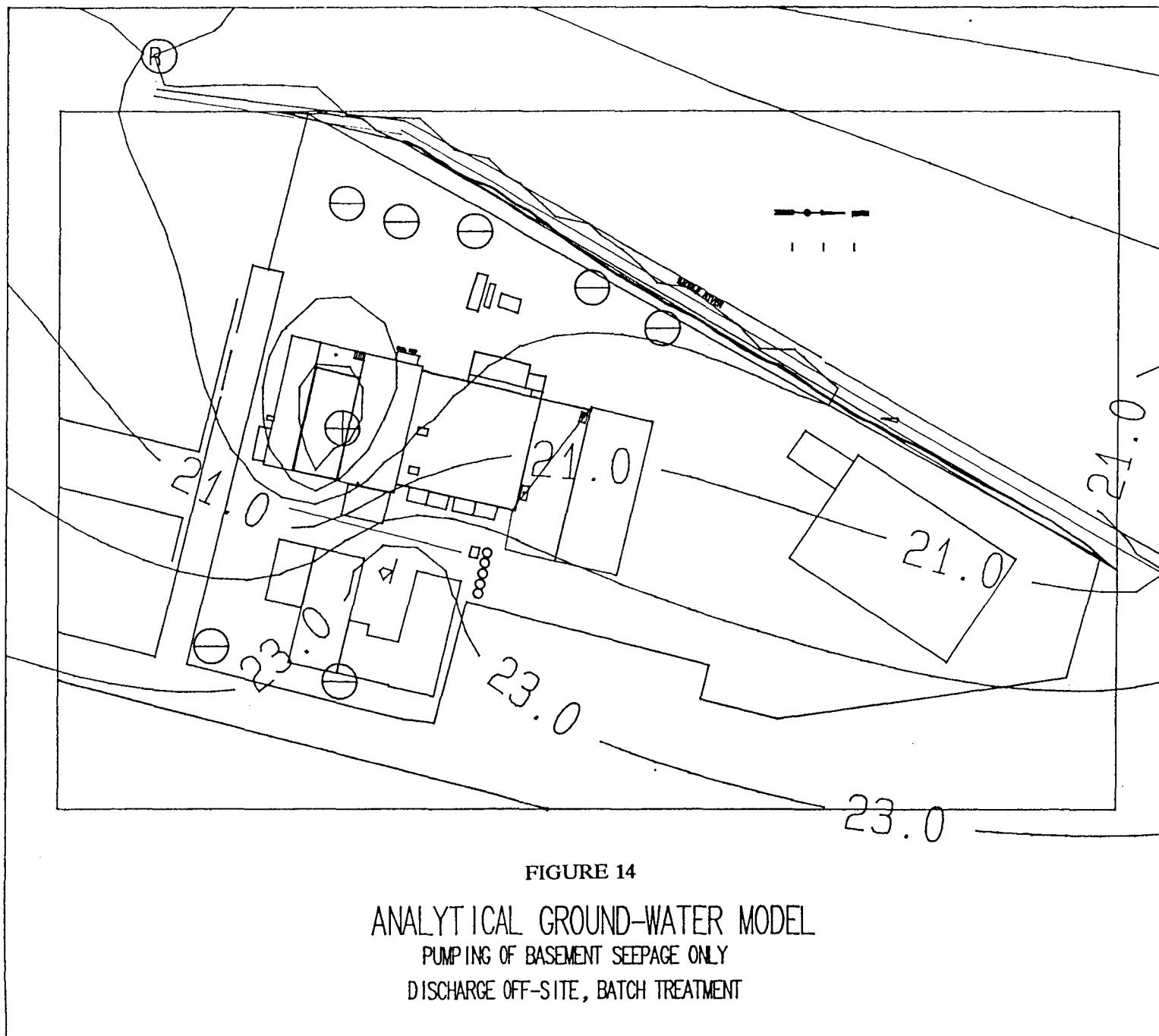
Aquifer characterization tests were performed on the upper overburden aquifer in October, 1990. The results of these tests were presented in the October, 1990 Update Report. The results table from that report (Table 1) is included here as Appendix C. In-situ hydraulic conductivity test were conducted on 22 ground-water control wells and short duration pumping tests were performed on selected control wells. The purpose of this characterization was to provide a plan for a ground-water control system that would include pumping the most prolific wells utilizing the most efficient well spacing.

The hydraulic characterization of the upper overburden aquifer, showed that the average hydraulic conductivity is 3.30×10^{-3} ft/min, with a transmissivity of 3.58×10^2 gpd/ft. Slug test values indicate relatively moderate hydraulic conductivity consistent with fine-grained sands comprising the aquifer. Results of the pumping tests indicated the most prolific wells would produce between 0.75 and 2 gallons per minute.

The aquifer hydraulics data collected during these pumping well and slug tests was imported into QuickFlow™ (Geraghty & Miller, Inc., 1991) to produce a simplified analytical ground-water flow model of the site. The model provides a highly simplified analyses of ground-water flow, however, the results appear to be a good approximation of what could be expected. Three alternatives for discharge were investigated using this analytical model.

- No discharge to ground water, discharge off-site
- Discharge to infiltration gallery (113 ft. length)
- Discharge to infiltration gallery (256 ft. length)

UPPER OVERBURDEN AQUIFER



884160075

MODEL PARAMETERS

AQUIFER:

$K = 4.32 \text{ cu ft/dy}$

TOP OF AQUIFER = 26 ft

BOTTOM OF AQUIFER = 14 ft

LOSS TO RIVER = 3.20 cu.ft/day/ft

SYSTEM:

INFLUENT:

1 sump • 16.5 cu.ft/dy

EFFLUENT:

no more than 4 gpm

INFILTRATION TRENCH:

NONE

OTHER:

leakage from water lines = 16 cu.ft/dy